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Acronym List

Acronym	Definition
3DES	Triple DES
AES	Advanced Encryption Standard
AICPA	American Institute of Certified Public Accountants
ANSI	American National Standards Institute
API	Application Programming Interface
APSV	Application Services
B2B	Business-to-Business
BAM	Business Activity Monitoring
BEA	Business Enterprise Architecture
BMMP	Business Management Modernization Program
BPEL	Business Process Execution Language (for Web Services
BPEL4WS	Business Process Execution Language for Web Services
BPM	Business Process Management
C4ISR	Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance
CADM	C4ISR Core Architecture Data Model
CDMA	Code Division Multiple Access
CIM	Common Information Model
COI	Community of Interest
COLL	Collaboration Services
COM	Component Object Model
CORBA	Common Object Request Broker Architecture
COTS	Commercial Off The Shelf
CRD	Capstone Requirements Document
CRT	Cathode Ray Tube
DB2	Database 2

Acronym	Definition
DBA	Database Administration
DBMS	Database Management System
DES	Data Encryption Standard
DII COE	Defense Information Infrastructure Common Operating Environment
DISC	Discovery Services
DISR	Department of Defense Information Technology Standards Registry
DoD	Department of Defense
DoDAF	Department of Defense Architecture Framework
DoDD	Department of Defense Directive
DoD EA TRM	DoD Enterprise Architecture Technical Reference Model
DW	Data Warehouse
EAI	Enterprise Application Integration
ebXML	Electronic Business Extensible Markup Language
EM	Enterprise Management
EMSV	Enterprise Management Services
ESM	Enterprise Service Management
ETL	Extraction, Transformation and Load
FDIC	Federal Deposit Insurance Corporation
GES	GIG Enterprise Services
GIG	Global Information Grid
GIS	Geographic Information Systems
GSM	Global System for Mobile
HDTV	High Definition Television
HRSV	Human Resources Services
HTML	Hypertext Markup Language
HTTP	Hyper Text Transfer Protocol

Acronym	Definition
IAS	Information Assurance/Security
IDS	Intrusion Detection System
IEEE	Institute of Electronics & Electrical Engineers
IETF	Internet Engineering Task Force
IHS	IBM Hyper Text Transfer Protocol Server
IOS	Input/Output Subsystem
IP	Internet Protocol
ISO	International Organization for Standardization
ISWG	Information Technology Standards Working Group
IT	Information Technology
ITSV	Infrastructure Transport Services
J2EE	Java 2 Enterprise Edition
JME	Java Management Extensions
JTA	Joint Technical Architecture
LAN	Local Area Network
LDAP	Lightweight Directory Access Protocol
LGSV	Logistics Services
MB	Megabyte
MDSV	Mediation Services
MICR	Magnetic Ink Character Recognition
MLS	Multi-Level Security
MPLS	Multi Protocol Label Switching
MQ	Message Queuing
MSGs	Messaging Services
NG	Next-Generation
.NET	Microsoft XML Web Services platform
NIST	National Institute of Standards and Technology

Acronym	Definition
NCES	Net-Centric Enterprise Services
OASIS	Organization for the Advancement of Structured Information Standards
OFDM	Orthogonal Frequency Division Multiplexing
OLAP	On Line Analytical Processing
OMB	Office of Management & Budget
OO	Object Oriented
OS	Operating System
OV	Operational View
P2P	Peer-to-Peer
P4	Pentium 4
PCMCIA	Personal Computer Memory Card International Association
PKE	Public Key Enable
PKI	Public Key Infrastructure
PMML	Predictive Model Markup Language
QOS	Quality of Service
RAM	Random Access Memory
RDBMS	Relational Database Management System
RFID	Radio Frequency Identification
ROI	Return on Investment
RTE	Real Time Enterprise
SAML	Security Assertions Markup Language
SAN	Storage Area Network
SAP	Systems, Applications and Products
SEC	Securities and Exchange Commission
SECS	Security Services
SETI	Search for Extra Terrestrial Intelligence
SNA	Social Network Analysis

Acronym	Definition
SOA	Service Oriented Architecture
SOAP	Simple Object Access Protocol
SPML	Service Provisioning Markup Language
STOR	Storage Services
SV	Systems View
SV-1	System Interface Description
SV-4	Systems Functionality Description
SV-9	Systems Technology Forecast
TCP/IP	Transmission Control Protocol/Internet Protocol
TRM	Technical Reference Model
TV	Technical Standards View
TV-1	Technical Architecture Profile
TV-2	Standards Technology Forecast
UA	User Assistance
UASV	User Assistance Services
UK	United Kingdom
UML	Unified Modeling Language
US	United States
VOIP	Voice Over Internet Protocol
VPN	Virtual Private Network
W3C	World Wide Web Consortium
WCDMA	Wideband Code Division and Multiple Access
WAN	Wide Area Network
WS	Web Service
WSFL	Web Services Flow Language
XACML	Extensible Access Control Markup Language
XBRL	Extensible Business Reporting Language

Acronym	Definition
XML	Extensible Markup Language
XMLA	Extensible Markup Language for Analysis
XrML	Extensible Rights Markup Language

1 SV-9 Product Description

1.1 Introduction

This document describes the current System Technology forecast (SV-9) for the Business Enterprise Architecture (BEA). The Product Description section supplements the product information in the BEA Overview and Summary Information (AV-1) document. Following this description is a set of tables that provide the system technology forecasts that apply to the BEA and must be used in its implementation. Finally, the Engineering Decision Record provided in the Appendix supplements the information in the Architecture Development Methodology (ADM) Operational View (OV)-Systems View (SV)-Technical Standards View (TV) Modeling Guidelines to provide insight into the development of this product.

1.2 System Technology Forecast Definition and Purpose

According to the DoD Architecture Framework (DoDAF), the SV-9 provides “Emerging technologies and software/hardware products that are expected to be available in a given set of time frames and that will affect future development of the architecture”. The Department of Defense Architecture Framework (DoDAF) is designed to document the operational, systems, and technical views of actual information processing systems. The Business Enterprise Architecture (BEA) is not a system, but a high-level architecture of operational activities, system components, and technical standards from which a BEA compliant information system may be constructed. As such, the BEA Systems Technology Forecast (SV-9) does not provide detailed descriptions of specific hardware and software products as indicated by the Department of Defense Architecture Framework SV-9 definition above. Instead, the BEA SV-9 contains forecast information about the evolution and advance of technologies and other trends in information processing capabilities. This is an important distinction for the reader to bear in mind as they review the contents of this document.

The BEA related technology forecasts are organized into short-term, mid-term, and long-term classes with confidence factors as suggested by the source of the information. Confidence factors are estimates, represented, as decimal numbers between 0 and 1, of the assurance the source possesses that the forecast statement will occur. A forecast of 0.5 represents a 50% likelihood of occurrence. A forecast with a confidence factor of 0.9, or 90%, has a very high probability of occurrence.

Forecast information has been developed through research efforts and interviews with technology specialists in the government, commercial, and third party organizations. The BEA SV-9 is intended for use by BEA system developers as a means of looking into the future of information technology for the purpose of guiding new systems development toward emerging best practices.

The BEA SV-9 is presented in a matrix format and addresses technologies with significant potential to influence the future of the BEA architecture. These forecasts deliver fundamental assessments of various technology areas and should be referred to when considering the forward evolution of BEA systems designs. Specifically, the SV-9 provides the following four types of information:

- Emerging capabilities

- Industry trends
- Forecasts
- Forecast confidence factors

This information is presented in a matrix format that summarizes the forecast information and confidence factors for a variety of technologies

1.3 Structure of the BEA SV-9

The previous paragraph indicates a hierarchical structure to the SV-9, consisting of a three tier set of categories: service areas, which contain services, that conform to standards. Such a structure makes it easier for architecture implementers and system designers to locate the standards that apply to them. The structure adopted for the BEA TV-1 is that defined by the Core Architecture Data Model (CADM) for a DoDAF-compliant architecture. The CADM calls these categories:

- Technology Service Areas;
- Technical Services; and
- Standards

As shown in Figure 1-1, Relationship between Technology Service Area, Technical Service, and Standard, one-to-one and one-to-many relationships may exist at any level of this hierarchy. Technology Service Areas group similar Technical Services together for increased organization and comprehension. There may be one or more Technical Services in any given Technology Service Area. For example, Wireless Local Area Network (LAN) and Ethernet are both considered Technical Services within the Data Transfer Technology Service Area. Standards represent agreed to means to implement all or part of a Technical Service. For example, Institute of Electrical and Electronics Engineering (IEEE) 802 standards are used to implement Ethernet and wireless networks. One or more standards support a given Technical Service.

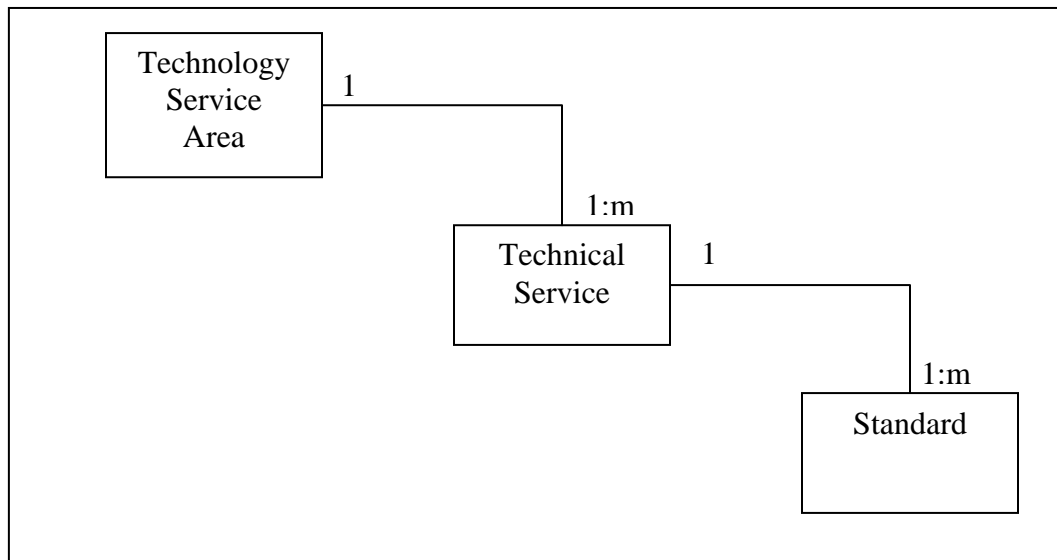


Figure 1-1, Relationship between Technology Service Area, Technical Service, and Standard

1.4 Relating TV Technical Services to SV Enterprise Services

The Technical Services that are assigned to each of these Technology Service Areas within the BEA TV products support the development of BEA-compliant information systems. These Technical Services were derived from and correspond to the nine Core Enterprise Services (CES) defined by the Net-Centric Enterprise Services (NCES) program office as the main components of the Enterprise Information Environment (EIE) defined by the Global Information Grid (GIG). In addition, three other GIG Enterprise Services (GES), Human Resources Services, Infrastructure and Transport Services, and Logistics Services are addressed. During the development of the BEA, these GES have been associated with and linked to the definitions of the system entities that represent the required system capabilities shown in the BEA SV-1. The actual relationship between the TV Technical Services and SV Enterprise Services currently shown in the BEA was established through the detailed analytical efforts of TV and SV Team members.

Figure 1-2, Relationship between TV Technologies and SV Enterprise Services, shows how the TV-1 Technical Services are connected to the Enterprise Services to bridge the TV and SV for the BEA. To connect to the Technical Services to the system entities that compose the BEA SV, a physical link has been established between Technical Services and Enterprise Services assigned to system entities in the Popkin System Architect (SA) tool that is used to maintain the BEA.

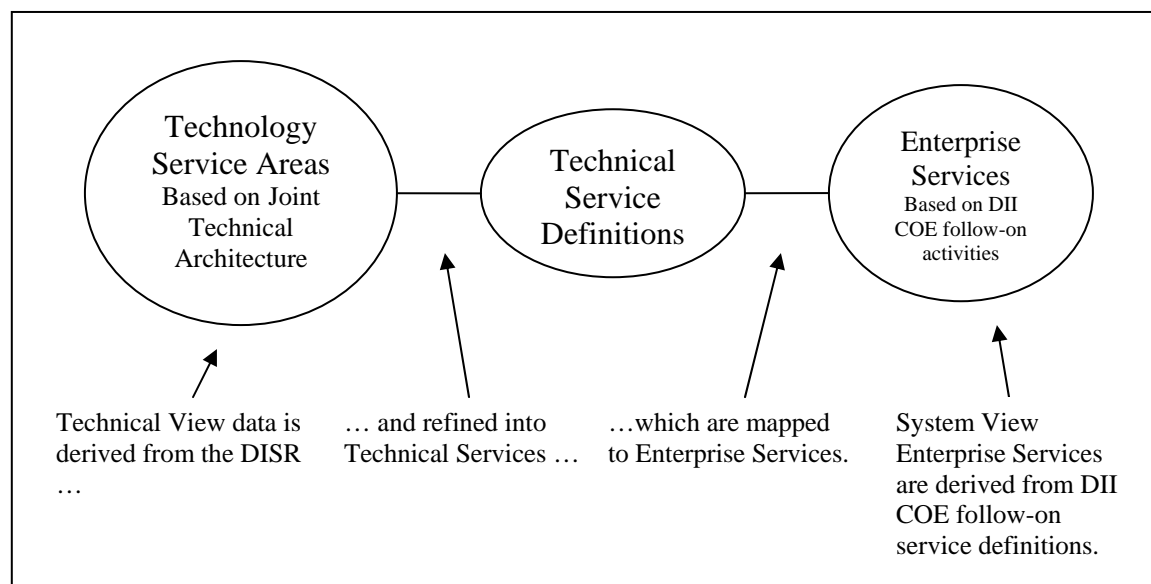


Figure 1-2, Relationship between TV Technologies and SV Enterprise Services

1.5 Mandated Standards

Mandated standards are essential for providing interoperability and net-centric services across the DoD enterprise. These are current and established standards that are generally required as the “must comply” standards that implement the Technical Services without deviation. Mandated standards usually include the most widely adopted and mature technologies available, for example Ethernet and HTML.

Compliance with the DISR is mandated for all DoD information systems to support interoperability and net-centricity across the DoD Enterprise. To accommodate this requirement, all the BEA TV-1 Standards were adopted from mandated standards in the latest version of the DISR, which at the time of this TV-1 is DISR Baseline Release 04-2.0.

Some mandated standards are flagged in the TV-1 as “sunset”. This designate indicates that they will be deleted from the BEA TV-1 on a future date to be determined by a specific predefined event. This “sunset” flag and the specific event that will trigger the retirement of the standard is indicated in the status column of the Standards tables that follow.

In order to avoid influencing system developers and architecture users toward a particular commercial solution, BEA TV analysts made a conscious effort during TV-1 product development to focus only on technologies, Technical Services, and Standards that support them, while avoiding discussion of the actual commercial products that implement them. This approach avoids the appearance that a particular commercial solution is preferred, while simultaneously delivering a complete and unbiased description of the Technical Service and Standards available to the BEA. It further decreased the likelihood of BEA products subsequently influencing solution developers and architecture users toward a specific product for implementation of the architecture.

1.6 SV-9 Development Process

The process used to develop and maintain the SV-9, TV-1 and TV-2 involves a lifecycle of five high order activities:

- Identify and define Technical Services data using specific selection criteria
- Organize that information into a data repository
- Collect additional information through subject matter expert interviews
- Refine the data collection to meet BEA requirements
- Produce the SV-9 product

The preceding combination of activities and requirements analysis outlines the procedural lifecycle used to establish, develop, and maintain the system technology forecasts of the BEA.

A review of the DoDAF documents and a concurrent analysis of the CADM data schema helped to identify all the data elements required for development of the TV-1 product. A baseline model for the TV-1 and a data repository facilitated the recording and reporting of TV-related data as it was developed for the BEA. Specific selection criteria, including DISR compliance and BEA applicability, were applied to data collected during extensive research, interviews, and analysis to develop the preliminary standards data used to populate and update the data repository. Collected data selected for inclusion in the TV-1 was reviewed by designated Government representatives and approved prior to inclusion in the Data Repository. The content of the data repository was extracted using pertinent reporting tools and assembled into this document, which represents the official BEA TV-1 product.

The fundamental requirement driving the content of the TV data repository is the mandate for compliance with the DISR. This was an appropriate requirement to begin with in light of the relative immaturity of SV products in the initial stages of BEA development. As the BEA products have matured, however, it is becoming possible to derive requirements for Technical Services in the TV data repository from the linkage of these services to system entities as shown in the SV-1. The result of this effort has been an end-to-end mapping of Enterprise Services in the SV to Technical Services shown in the TV. Based on the results of that mapping, a gap analysis facilitates the identification of Enterprise Services for which Technical Services have not been established, or conversely suggest Technical Services that might support an as yet unrecognized Enterprise Service.

In preparation for the data collection effort, TV analysts reviewed guidance and requirements from several sources, including:

- Clinger-Cohen Act

- OMB Circular A-130
- DoD Directive (DoDD 5200.2-R
- DoDD 5101.7
- DoDD 5200.1
- DoDD 5200.28
- DoDD 8000.1CADM v2.0
- GIG Capstone Requirements Document (CRD)

With this guidance, the TV team revalidated the plan to leverage standards recorded in the latest version of the DISR. TV analysts subsequently generated a baseline collection of data for input to the data repository. This accomplishment required a period of grooming in which data from the latest version of the DISR was sorted and mapped into the schema of Technology Service Area, Technical Service, and Standards. After loading the data into the repository, the SV-9 team generated updated draft versions of the SV-9.

Producing an updated version of the product does not signal the end of the SV-9 development process. Using the latest draft versions, the team enters a phase of analysis, which tailors the contents of the data repository to meet the specific needs of the current BEA release. This activity is guided by changes in requirements derived from the BEA SV products. It drives the addition of new standards into the repository while simultaneously removing others. These engineering decisions and the rationale behind them are documented in Appendix A. The decisions made during this phase will continue to drive refinement and change in the Sv-9 product as it evolves over time.

During this analytical procedure, additional sources of data are considered by the SV-9 team. These sources include technical experts (from contractor, commercial, and government organizations), industry newsletters, and white papers. Iterations of the development process introduce new information, which the SV team refines, imports, and relates to BEA through subsequent releases of the SV-9. Ongoing performance of this analytical lifecycle will keep these products of the BEA at a point where they remain relevant and valuable to BMMP systems developers.

2 Technical Service to System Entity Linkage

Enterprise Services are building blocks of the BEA framework. Not only do they bridge the gap between operational functions and the technologies that will enable those functions, they provide a standard interface to the DoD GIG. Through this interface, the BEA will confirm that it implements system functions that will be able to communicate to other GIG-compliant frameworks. To maintain compliance with the GIG, the BEA Enterprise Services will generally follow the evolving GIG Enterprise Services (GES). The defined Enterprise Services in BEA currently consist of the following:

- **Application Services:** Services that host, acquire, and maintain infrastructure and mission functions. Services enable tailoring of functions and interfaces to adjust to User needs. The system functions associated with this service support shared applications and distributed applications.
- **Collaboration Services:** Services that enable the interaction of two or more people, organizations, agencies, or assets to share multimedia data, information, applications, and common situational perspectives. Includes conducting asynchronous and session-based dialogues and meetings. The system functions associated with this service support Management of Collaborative Groups, Virtual Workspaces, and Collaborative Services.
- **Discovery Services:** Services that facilitate the search and retrieval of information content stored in Catalogs, Directories, and Registries. Also includes information that will be acquired in the future in response to an RFI.
- **Enterprise Management Services (EMSV):** Services that provide all aspects of systems and network management. This also includes management of Net-Centric Enterprise Services (NCES) specific resources. The system functions associated with this service support management of User Profiles, Communities of Interest (COI), Catalogs and Directories, Publish and Subscribe Lists, Messaging Boards, and Information Restoration.
- **Human Resources Services:** Services that specialize in military and civilian personnel, military healthcare, safety, occupational health, and defense travel. It is responsible for leading business transformation within the HRM domain, which includes the Military Health Sub-Domain, the Military HRM Sub-Domain, and the Civilian HRM Sub-Domain.
- **Infrastructure Transport Services:** Services enabling the support of physical infrastructure and connectivity required to support all network activity.
- **Logistics Services:** Services that support Logistics Transformation that includes a DoD logistics enterprise able to support rapid, agile deployment, employment and, sustainment of the total force across the full spectrum of operations in a cost-effective manner.
- **Mediation Services:** Services that translate, aggregate, fuse, and integrate data/information. This addresses Situational Awareness and Alert Activation.
- **Messaging Services:** Services that provide the ability to exchange information among Users and applications via formal (organizational) and informal (email and message boards) messaging services, including structured and free form messages.

- **Security Services:** Services that provide for the protection and assurance of information and data that traverse the network centric environment. Included are measurement services that ensure security controls, policies and procedures, and protective measures to effectively address system risks (potential for exploit), threats (attacker), and vulnerabilities (weakness).
- **Storage Services:** Services that manage the storage of data in a data warehouse and associated datamarts, and satisfy GIG information assurance requirements. The system functions associated with this service support Information Storage, Retrieval, Deletion, and Archiving.
- **User Assistance Services:** Services that provide assistance to any User (individuals, organizations, and physical assets) that interfaces with the NCES. The User Assistant supports the User anytime he connects to the Grid regardless of where he is located. This assistance includes: managing information exchanges between the User and the NCES; evaluating changing User requirements and interactions, dynamically updating the User profile; adjusting NCES interactions with the User based on User event history; and managing User quality of service (QOS) needs. When the User is disconnected from the Grid, the User Assistant maintains a presence with the User. A User Surrogate maintains a presence in the Grid representing the User. The User Surrogate is capable of processing certain transactions for the user. Other transactions are queued for the User until the User is re-connected to the Grid and can then receive the transactions.

Establishing a relationship between the enterprise services and system entities, and a relationship between the technical services and the enterprise services, is critical for creating a full linkage from the business processes to standards in the architectural design. This product focuses on that relationship.

2.1 Purpose

The purpose of the enterprise services to system entity linkage matrix is to define the relationship between business processes and the infrastructure services that BEA will use to implement them. The purpose of the enterprise services to system entity linkage matrix is to define the relationship between business processes and the infrastructure services that BEA will use to implement them.

2.2 Approach

To expand upon the methodical approach mandated in the DoDAF Framework, the BEA team examined the framework to establish the relationship between business operations, the infrastructure and system functions that support those operations, and the standards that comprise the infrastructure services. Following the GIG's lead, BEA instantiates those services as enterprise services to ensure alignment with future DoD architecture initiatives. Identifying how the enterprise services relate to all of the other constituents of the framework is critical for determining how the infrastructure will specifically bring all of the pieces together to define a system-level architecture. Figure 2-1, BEA Infrastructure Relationships, illustrates the BEA approach to this relationship.

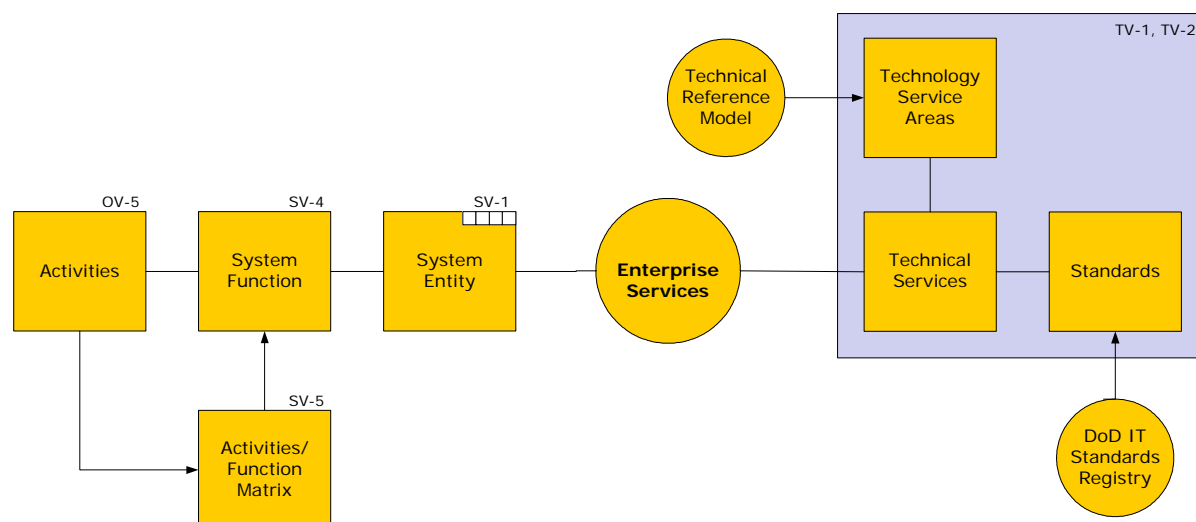


Figure 2-1, BEA Infrastructure Relationships

The BEA implementation of the DoDAF framework takes advantage of the concept that their lower-level constituents best represent high-level architectural objects. Using this approach, the BEA team defined the system entity in the SV-1 as a grouping of business-focused system functions. In this way, the architecture illustrates system-level support for business operations through the framework linkage between the Systems Functionality Description (SV-4) and the SV-1. From there, the BEA team established that the architecture must illustrate how enterprise services support the system entity requirements. Varying requirements between system entities will result in specific enterprise services implementations for each entity.

2.3 System Entity to Enterprise Service Linkage Matrix

Many of the Enterprise services currently defined in the BEA are in fact core enterprise services and relevant to all BEA systems. In compliance with the net-centric concept of core enterprise services, all internal system entities are linked to all the core enterprise services. Currently there are two enterprise services defined in the BEA that are exclusively used by specific system entities in the business domains. Therefore, at this time all internal system entities in the BEA link to all the core enterprise services. These core enterprise services are: Application Services, Collaboration Services, Discovery Services, Enterprise Management Services, Human Resources Services, Infrastructure Transport Services, Logistics Services, Mediation Services, Messaging Services, Security Services, Storage Services, and User Assistance Services. In addition, there are two business enterprise services that are linked to particular system entities. The linkage matrix in Table 2-1, System Entity to Enterprise Service Linkage Matrix, shows this relationship.

Table 2-1, System Entity to Enterprise Service Linkage Matrix

Enterprise Services	System Entities
Application Services (APSV) Collaboration Services (COLL) Discovery Services (DISC) Enterprise Management Services (EMSV) Infrastructure Transport Services (ITSV) Mediation Services (MDSV) Messaging Services (MSGs) Security Services (SECS) Storage Services (STOR) User Assistance Services (UASV)	Acceptance Acquisition Plan Allotment and Allocation Billing Business Enterprise Reporting Business Plan Business Rules Buy Order Career Development Collections Commercial Pay Entitlements Commissaries and Exchanges Commitments Configuration Cost Customer or Vendor Profile Data Delinquent Debt Delivery Disbursements Disposal DoD Program and Budget Employee Benefit Environmental Safety and Occupational Health Export Control Financial Information Structure Funds General Ledger Investments Knowledge Law Enforcement Legal Services Make and Build and Maintain and Sustain Manufacturing and Production Military Healthcare Obligations

Enterprise Services	System Entities
APS COLL DISC EMSV ITSV) MDSV MSGS SECS STOR UASV	Payroll Performance Evaluation Performance Metrics Personnel Personnel Security Position Structure Program Execution Program Formulation Quality Control Receivables Return Sales Order Science and Technology Space Subordinate Command-Level Program and Budget System Engineering Test and Evaluation Time and Attendance Training Travel Workflow
Human Resources Services (HRSV)	Career Development Commissaries and Exchanges Employee Benefit Law Enforcement Legal Services Military Healthcare Payroll Performance Evaluation Personnel Personnel Security Position Structure Time and Attendance Training Travel

Enterprise Services	System Entities
Logistics Services (LGSV)	Delivery Disposal Make and Build and Maintain and Sustain Return

2.4 Enterprise Service to Technical Service Linkage Matrix

The matrix in Table 2-2, Enterprise Service to Technical Service Linkage Matrix, captures the relationships between the Technical Services and Enterprise Services, but some linkage issues remain to be addressed. The core enterprise services have been added as BEA technical services linked to standards in the BEA and so there is currently a one to one relationship between current enterprise services and the associated technical services. This gap demonstrates a potential requirement to further define the scope of the Enterprise Services to confirm that all necessary Technical Services have adequate representation in the BEA.

Table 2-2, Enterprise Service to Technical Service Linkage Matrix

Enterprise Service	Technical Service	Technical Service Description
Application Services (APSV)	Application	The set of standards governing operations, including hosting environments, operating environments, operational management and support. The primary responsibility of the Application service layer is to structure, standardize and protect the operating environment of the GIG by offering a model operating environment that provides the application infrastructure on which DoD computer applications rely.
Collaboration Services (COLL)	Collaboration	A set of standards enabling edge-user access and participation in near real-time information-based human interaction across geographically dispersed sites and organizations. This activity provides and controls the shared resources, capabilities, and communications that allow real-time collaborative interactions among participating group members.
Discovery Services (DISC)	Discovery	A set of standards that enable information knowledge and data resource detection, including standards for searching, data mining, retrieval, and display of information resources. Discovery services provide visibility and facilitate access to information and services available in the Net-Centric environment.

Enterprise Service	Technical Service	Technical Service Description
Enterprise Management Services (EMSV)	Enterprise Service Management (ESM)	The set of standards that support the management of operational processes, procedures and technical capabilities needed to ensure the GIG ES and backbone network services are up and running, accessible and available to users, protected and secure. The ESM set of services provides end-to-end GIG performance monitoring, configuration management and problem detection/resolution, as well as enterprise IT resource accounting. Additionally, this service area encompasses general help desk and emergency support to users.
Human Resources Services (HRSV)	Human Resources	Specializes in military and civilian personnel, military healthcare, safety, occupational health, and defense travel. It is responsible for leading business transformation within the HRM domain, which includes the Military Health Sub-Domain, the Military HRM Sub-Domain, and the Civilian HRM Sub-Domain.
Infrastructure Transport Services (ITSV)	Infrastructure Transport	Set of standards enabling the support of physical infrastructure and connectivity required to support all network activity. The role of Infrastructure Transport is centered on emerging Wireless Interface technologies and standards to support the development of a GIG Wireless implementation.
Logistics Services (LGSV)	Logistics	Responsible for Logistics Transformation that includes a DoD logistics enterprise able to support rapid, agile deployment, employment and, sustainment of the total force across the full spectrum of operations in a cost-effective manner.
Mediation Services (MDSV)	Mediation	A set of standards enabling negotiation between information providers and users to satisfy the requirements of the user. Mediation allows for the automated consumption, modification, conversion, fusion and routing of information from one or multiple systems.
Messaging Services (MSGV)	Messaging	The set of standards governing the ability to exchange information securely among users or applications. Messaging provides services to support asynchronous and synchronous information exchange.

Enterprise Service	Technical Service	Technical Service Description
Security Services (SECS)	Information Assurance/Security (IAS)	Information-Assurance-and-Security-standards-include-all-levels-of-classification-and-encompasses-availability,-integrity,-authentication,-confidentiality,-auditing,-and-non-repudiation.--The-primary-responsibility-of-an-IAS-Service-is-to-minimize-IT-risk-and-ensure-that-the-integrity-of-the-GIG-enterprise's-networks-and-systems-is-not-compromised.
Storage Services (STOR)	Storage	A set of storage standards enables the persistent storage, protection, and retrieval of data and information. Storage provides both storage architecture and storage area management, including operations and capacity management.
User Assistance Services (UASV)	User Assistance	Set of standards that enable person-related accessibility and user-oriented smart agents. User Assistance (UA) services are automated capabilities that learn and apply user preferences and patterns to assist users to efficiently and effectively utilize GIG resources in the performance of tasks.

3 BEA SV-9 Forecasts

3.1 Current Forecasts

Table 3-1, Current Forecasts, lists the various technical services, their descriptions, and the details of the current forecasts.

Table 3-1, Current Forecasts

Technical Service	Description	Short-Term Forecast	Mid-Term Forecast	Long-Term Forecast
3.1.1 Application	The set of standards governing operations, including hosting environments, operating environments, operational management and support. The primary responsibility of the Application service layer is to structure, standardize and protect the operating environment of the GIG by offering a model operating environment that provides the application infrastructure on which DoD computer applications rely.	Application Hosting, as a delivery and management model and as a market opportunity is established as a very substantial element within the overall IT solutions marketplace. Time Frame: 2004-2005 Confidence Level: 0.9	Most new application and integration projects will, in part, use Web services technology and Service-oriented Architecture (SOA) will be the emerging mainstream software architecture. Time Frame: 2006-2007 Confidence Level: 0.8	Most applications will employ some form of business rule technology, externalizing business rules. Application integration and development tools will evolve to support rapid composition of “personal” enterprise applications and business processes tailored to small targeted groups of users, intended for a short duration of use. Semantic Web technologies will begin to offer the infrastructure for the unified semantics that are needed to support dynamic application integration at the enterprise level. Time Frame: 2008-2010 Confidence Level: 0.7

Technical Service	Description	Short-Term Forecast	Mid-Term Forecast	Long-Term Forecast
3.1.2 Application Security	<p>Application security covers architecture elements and design issues that directly impact design decisions made by application developers. Within the context of an enterprise application, security is concerned with the following:</p> <p>Authentication — verifying that users are, in fact, who they claim to be</p> <p>Authorization — entitling users to access certain application functions and data: An extended definition might include encryption, to protect data from unauthorized viewing, and data integrity checksums, to protect data in-transit from unauthorized modification.</p> <p>Administration — tools for centralized and/or distributed maintenance of user data and security policy</p> <p>Audit — ensuring that security analysts have audit trails to determine who did what (including necessary logging mechanisms to record users' actions)</p> <p>Reference: Giga: Model for Enterprise Application Security Integration,</p>	<p>Relies mainly on network security and data encryption in middleware. Application securability concerns (i.e., secure coding, integration, infrastructure) will increase during 2004-06, due to multiple application architectures (for example, mainframe, client/server, Web application, Web services). Web services security needs will escalate gradually as Web services go external.</p> <p>Time Frame: 2004-2005 Confidence Level: 0.9</p>	<p>Single sign-on issues remain although through brute force integration single sign-on façade established. Authentication joins privacy/confidentiality as key concern. Conceivable that smart cards become universal although back end systems may preclude their use in order to protect privacy. Web services security standards conflicts and performance bottlenecks will increase as mobile access and grid computing (2005+) needs for dynamic end-to-end authentication and authorization grow.</p> <p>Reference: Meta Group Research, Security & Risk Strategies</p> <p>Time Frame: 2006-2007 Confidence Level: 0.8</p>	<p>Smart card and other authentication devices become commonplace. Government bodies issue passwords and crypto systems. The maturity and transparency of PKI components (that is, embedded in the Network Operating System, Directories, and File Systems) will accelerate widespread use of encryption, particularly at the Database Management System (DBMS) layer. Privacy becomes major public issue: Organizations will begin to focus more attention on protecting the application as network security advances begin to level off.</p> <p>Time Frame: 2008-2010 Confidence Level: 0.7</p>

Technical Service	Description	Short-Term Forecast	Mid-Term Forecast	Long-Term Forecast
	Randy Heffner, June 22, 2001			

Technical Service	Description	Short-Term Forecast	Mid-Term Forecast	Long-Term Forecast
3.1.3 Application Servers	<p>Application servers connect users (often running web browsers or client applets) to data or information housed in a backend database system.</p> <p>Reference: Gartner: Application Servers Transform Into Application Platforms, Note Number: LE-20-7835 Gartner: Events Will Transform Application Servers, Note Number: T-20-2918</p>	<p>Java 2 Platform, Enterprise Edition (J2EE) is well established as a platform for mainstream business applications. Users understand the strengths and weaknesses of Microsoft XML Web Services platform (.NET) technology. The power of the new .NET architecture has become more apparent.</p> <p>Time Frame: 2004-2005 Confidence Level: 0.8</p>	<p>Primarily J2EE application servers and the Microsoft .NET Framework/ Component Object Model (COM)+ application servers are the dominant technology platforms. The ubiquity of the J2EE standard has driven commoditization of the Java application server market, including the emergence of open source J2EE application servers that are “good enough” for a growing number of enterprise needs. Most organizations developing with Java will make some use of open source application server components. Microsoft software technologies such as .NET managed code for enabling of software integration through the use of Web services matures. All Microsoft applications are based on .NET.</p> <p>Time Frame: 2006-2007 Confidence Level: 0.8</p>	<p>Two architectures: Sun's J2EE and Microsoft's .NET/COM+ will remain dominant in the enterprise application server market, although the names may possible evolve. There will be 5-6 major vendors who will dominate.</p> <p>Time Frame: 2008-2010 Confidence Level: 0.7</p>

Technical Service	Description	Short-Term Forecast	Mid-Term Forecast	Long-Term Forecast
3.1.4 Application Software	<p>The focus for application software is to increase the performance of business or personal resources. It enables users to leverage the power of computers toward achievement of their business, professional or personal objectives or goals.</p> <p>Reference:</p> <p>Gartner: Infrastructure and Applications Worldwide Software Market Definitions, Note Number: SOFT-WW-GU-0004</p>	<p>Global delivery services for application software refer to a delivery model in which work is done by a virtual team that may consist of personnel that are on-site, onshore, near-shore or offshore. The large majority of enterprise buyers who make decisions based on proven options are now actively engaging the global sourcing model.</p> <p>Time Frame: 2004-2005 Confidence Level: 0.7</p>	<p>Software as service models emerge. Application service providers are accepted as alternate delivery model. Managed services -- the remote monitoring and management of IT, including networks, servers, enterprise applications, security devices, databases, e-mail -- from a centralized, utility-based network and systems management platform is a realistic option for many applications.</p> <p>Time Frame: 2006-2007 Confidence Level: 0.8</p>	<p>Open-source, vertical applications specifically for the public sector mature. Also, open source business applications such as customer relationship management, sales force automation, and HR and financial business applications, are all serious options.</p> <p>Time Frame: 2008-2010 Confidence Level: 0.7</p>
3.1.5 Asset Management	<p>Technologies that support the identification and tracking of objects within a collection or inventory.</p>	<p>Bar codes are used with RF technology to provide a foundation for Warehouses Management Systems.</p> <p>Time Frame: 2004-2005 Confidence Level: 0.9</p>	<p>Tagging containers of items such as pallets, cases or ocean containers with RFID tags for limited tracking purposes becomes practical.</p> <p>Time Frame: 2006-2007 Confidence Level: 0.8</p>	<p>Radio Frequency Identification (RFID) standards and technology mature. Standards-based RFID tagging and tracking, at the individual item level, becomes feasible. Applications use RFID and bar codes to manage the detailed operations of warehouses and distribution centers.</p> <p>Time Frame: 2008-2010 Confidence Level: 0.7</p>

Technical Service	Description	Short-Term Forecast	Mid-Term Forecast	Long-Term Forecast
3.1.6 Collaboration	A set of standards enabling edge-user access and participation in near real-time information-based human interaction across geographically dispersed sites and organizations. This activity provides and controls the shared resources, capabilities, and communications that allow real-time collaborative interactions among participating group members.	Enterprises select the collaborative applications that align with their teams' predominant need. No single application will support all work styles. Products are used in concert with line-of-business applications specific to the functions of any workgroup. Time Frame: 2004-2005 Confidence Level: 0.9	Emerging technologies that will become essential: Enterprise Instant Messaging, E-mail response systems, Just-in-time e-learning. Time Frame: 2006-2007 Confidence Level: 0.8	Integration of general collaboration tools with line of business applications. Generic collaboration capabilities will be delivered as Web services, enabling them to be integrated more flexibly into line of business applications. Mobility will have a major impact on enterprises. Time Frame: 2008-2010 Confidence Level: 0.7
3.1.7 Cryptographic Security	Common cryptographic message syntax, common cryptographic algorithms and common modes of operation to support interoperability when using encrypted messages.	Improvements in performance and key management make the encryption of stored data practical. Enterprises that don't encrypt stored sensitive data will spend 50 percent more than enterprises that do, due to failure to comply with regulatory or contractual data protection requirements. Time Frame: 2004-2005 Confidence Level: 0.9	Advanced Encryption Standard (AES) is used to protect electronic information and completely replaces the U.S.-government-endorsed Data Encryption Standard (DES). 80 percent of Fortune 1000 enterprises will encrypt most critical "data at rest". Time Frame: 2006-2007 Confidence Level: 0.7	Encryption or key exchange technologies that are based on quantum physics principles become practical. These technologies may or may not include "quantum computing" technology. Technology in production uses quantum physics properties for key exchange only. Time Frame: 2008-2010 Confidence Level: 0.6

Technical Service	Description	Short-Term Forecast	Mid-Term Forecast	Long-Term Forecast
3.1.8 Data Management Services	The data management services provide for the independent management of data shared by multiple applications.	<p>As database management systems become more self-managed and self-healing, Database Administration (DBA) skill sets must evolve to higher-value data management functions (integrity, consolidation, archiving, integration) and new technologies (for example, document management, Web services). Data Extraction, Transformation and Load (ETL) tools, become a commodity item and basic ETL functionality is embedded in most major DBMS engines.</p> <p>Time Frame: 2004-2005 Confidence Level: 0.9</p>	<p>Operationally focused tasks (for example, monitoring, maintenance) will be outsourced to remote DBA providers. Technology improvements also enable better optimization of increasingly complex queries. Coupled with the inclusion of advanced algorithms for joins, aggregation and indexing in DBMS engines this enables systems to perform sophisticated data analysis.</p> <p>Time Frame: 2006-2007 Confidence Level: 0.8</p>	<p>XML data integration becomes practical, with XML data integration servers supporting many data sources including Relational Dams. This allows systems to get an integrated view of the results of a query from across many sources. As the focus of processing moves toward complex analytic processing - with transaction processing becoming commoditized, open source, or lower cost - stripped-down proprietary solutions will begin to supplant proprietary enterprise database software for basic OLTP processing.</p> <p>Time Frame: 2008-2010 Confidence Level: 0.8</p>

Technical Service	Description	Short-Term Forecast	Mid-Term Forecast	Long-Term Forecast
3.1.9 Discovery	A set of standards that enable information knowledge and data resource detection, including standards for searching, data mining, retrieval, and display of information resources. Discovery services provide visibility and facilitate access to information and services available in the Net-Centric environment.	Content management tools and directory/registry services are mainstream technologies. A combination of content management and portal-based solutions dominate for managing and delivering unstructured data. Metadirectory integration projects require agreement across all services/agencies on the ownership of overlapping attributes in directories. This is likely to be more difficult than the technical implementation. Time Frame: 2004-2005 Confidence Level: 0.9	Inference engines are integrated into DBMS, reducing the need for separate ontology inference tools. Time Frame: 2006-2007 Confidence Level: 0.8	Single Vendors solutions that offer best-of-breed technologies become available. and ontologies using strong knowledge representations are expected to become common. An ontology of roles and capabilities enables a system to dynamically route information and decisions. Time Frame: 2008-2010 Confidence Level: 0.7
3.1.10 Electronic Data Interchange	Messaging format for electronic transmission of business data	EDI remains a popular means of Business-to-Business (B2B) integration because of the maturity of established standards and the wide adoption of EDI-associated technologies. Time Frame: 2004-2005 Confidence Level: 0.9	XML becomes a real option and will be seen by many organizations as the successor to EDI. EDI and XML will both be available to organizations, but XML will begin to offer less expensive options. Time Frame: 2006-2007 Confidence Level: 0.8	Established XML schemas for many domain areas exist and provide the vocabularies that make XML the successor to EDI. Time Frame: 2008-2010 Confidence Level: 0.7

Technical Service	Description	Short-Term Forecast	Mid-Term Forecast	Long-Term Forecast
3.1.11 Enterprise Service Management (ESM)	The set of standards that support the management of operational processes, procedures and technical capabilities needed to ensure the GIG ES and backbone network services are up and running, accessible and available to users, protected and secure. The ESM set of services provides end-to-end GIG performance monitoring, configuration management and problem detection/resolution, as well as enterprise IT resource accounting. Additionally, this service area encompasses general help desk and emergency support to users.	ESM software for backup management is mature. Other types of ESM software matures and storage and configuration management markets consolidate. Enterprises include management functionality in their applications and application components. Time Frame: 2004-2005 Confidence Level: 0.8	No one vendor can provide the total solution. Enterprises invest in lower-layer Enterprise System Management tools so that a strong foundation can be built. Users also derive high value from point-products that address key areas within the IT infrastructure. Time Frame: 2006-2007 Confidence Level: 0.8	Root-cause analysis of problems with a distributed IT service is a reality for a constrained set of application architectures, thus enabling automated, policy-based corrective action. Policy-based management for distributed platforms becomes a reality. Time Frame: 2008-2010 Confidence Level: 0.7

Technical Service	Description	Short-Term Forecast	Mid-Term Forecast	Long-Term Forecast
3.1.12 Information Assurance/Security (IAS)	Information-Assurance-and-Security-standards-include-all-levels-of-classification-and-encompasses-availability,-integrity,-authentication,-confidentiality,-auditing,-and-non-repudiation.--The-primary-responsibility-of-an-IAS-Service-is-to-minimize-IT-risk-and-ensure-that-the-integrity-of-the-GIG-enterprise's-networks-and-systems-is-not-compromised.	Rapid growth of the IT security management market allows enterprises to reevaluate antivirus and related products and select of-breed or platform-specific products that may better serve their requirements. Time Frame: 2004-2005 Confidence Level: 0.9	As processing power and security algorithm performance increase, intrusion prevention grows in importance, while intrusion detection shrinks. Public-key Infrastructure (PKI) "disappears" into applications as an embedded feature, rather than remaining as an end product. Time Frame: 2006-2007 Confidence Level: 0.8	Vendors offer the ability to assemble and inspect packet payloads at wire speeds. Enterprises redirect intrusion detection system investments toward application defenses. Time Frame: 2008-2010 Confidence Level: 0.7
3.1.13 Infrastructure Transport	Set of standards enabling the support of physical infrastructure and connectivity required to support all network activity. The role of Infrastructure Transport is centered on emerging Wireless Interface technologies and standards to support the development of a GIG Wireless implementation.	802.11g, which provides the next step for wireless LANs in the 2.4 GHz band, supporting backward compatibility with 802.11b and a high-speed mode using Orthogonal Frequency Division Multiplexing (OFDM), matures and gains widespread usage. Time Frame: 2004-2005 Confidence Level: 0.9	Standards for increased WLAN security gel and allow for the ability to maintain data privacy during "over the air" transmission from the point of communication (mobile device) to the wireless access point or gateway. Financial transactions integrate with corporate Virtual Private Networks (VPNs) in order to secure enterprise data. Time Frame: 2006-2007 Confidence Level: 0.8	Wideband Code Division and Multiple Access (WCDMA) and Code Division Multiple Access 2000 (CDMA2000) achieve widespread adoption. Time Frame: 2008-2010 Confidence Level: 0.7

Technical Service	Description	Short-Term Forecast	Mid-Term Forecast	Long-Term Forecast
3.1.14 Internet Protocol	<p>Network data transmission service</p> <p>Reference: Hype Cycle for Networking and Communications, 2003 30 May 2003</p> <p>Bob Hafner Ian Keene Patti A. Reali Drew Kraus Bern Elliot Phillip Redman Richard D. Stiennon Bettina Tratz-Ryan Nick Allen</p> <p>IPv6: An Important, but Not Yet Urgent, Internet Standard 15 April 2002</p> <p>Robert Batchelder</p>	<p>Many Large companies, including the US DoD, build strategies to transition from IPv4 to IPv6. Initial Test beds, Prototypes and Pilots are performed by these organizations.</p> <p>Time Frame: 2004-2005 Confidence Level: 0.9</p>	<p>IPv6 Quality of Service standards are stable. Many large organizations begin the process of transitioning from IPv4 to IPv6.</p> <p>Time Frame: 2006-2007 Confidence Level: 0.8</p>	<p>All DoD IPv4 traffic has been transitioned to IPv6</p> <p>Time Frame: 2008-2010 Confidence Level: 0.7</p>

Technical Service	Description	Short-Term Forecast	Mid-Term Forecast	Long-Term Forecast
3.1.15 Mediation	A set of standards enabling negotiation between information providers and users to satisfy the requirements of the user. Mediation allows for the automated consumption, modification, conversion, fusion and routing of information from one or multiple systems.	<p>Integration Brokers Suites are reliable, proven technology that proves to be of very high value as a CES to support the GIG, including exchange of information with existing systems. Message-Oriented Middleware becomes pervasive, and is a commodity.</p> <p>Time Frame: 2004-2005 Confidence Level: 0.9</p>	<p>Message-Oriented Middleware's support for wireless mobile devices, including hand-held devices, makes this technology especially attractive. Web services and XML are both supported by multiple forms of middleware (IBS, MOM, J2EE, Common Object Request Broker Architecture (CORBA) and others) and become generally used.</p> <p>Time Frame: 2006-2007 Confidence Level: 0.8</p>	<p>Business Activity Monitoring (BAM) concepts and architectures result in mature and stable products.</p> <p>Time Frame: 2008-2010 Confidence Level: 0.7</p>
3.1.16 Medical	Standards for integration of content used for clinical, healthcare administrative, and retail pharmacy transactions.	<p>Security areas like Single-sign-on, HIPPA security and biometrics are widely implemented. Mandated compliance requirements with the HIPAA security standards by April 2005 also promote systems for encrypting e-mail that do not assume that recipients have digital certificates or anything installed on their PC other than a standard browser.</p> <p>Time Frame: 2004-2005 Confidence Level: 0.9</p>	<p>Standard controlled medical vocabulary - particularly coding schemes for medical concepts become de jure or de facto standards. The HL7 CDA, which gives standard XML representations for textual clinical documents, becomes widely used.</p> <p>Time Frame: 2006-2007 Confidence Level: 0.8</p>	<p>HL7 Version 3 messaging is the new generation of application integration standard for healthcare. It is built on a formal development methodology and a reference data model, and removes substantial ambiguity from previous versions.</p> <p>Reference: Gartner Hype Cycle for Healthcare Provider Technologies, 2003</p> <p>Time Frame: 2008-2010 Confidence Level: 0.7</p>

Technical Service	Description	Short-Term Forecast	Mid-Term Forecast	Long-Term Forecast
3.1.17 Messaging	The set of standards governing the ability to exchange information securely among users or applications. Messaging provides services to support asynchronous and synchronous information exchange.	The integration of Internet Protocol (IP) connectivity between switching platforms and unified messaging systems eases end-user migration to a converged voice and data environment. Time Frame: 2004-2005 Confidence Level: 0.9	Unified communications solutions mature and their focus shifts from individual productivity to business productivity. Time Frame: 2006-2007 Confidence Level: 0.8	Fully realized Instant Messaging changes how real-time business is conducted. Value accrues as enterprises embed IM at different levels of business processes to maximize reductions in lapsed time. Time Frame: 2008-2010 Confidence Level: 0.7
3.1.18 Network and Systems Management	Services designed to enable the management of networks and their connected computing assets. Reference: Hype Cycle for Enterprise Systems Management, 2003 30 May 2003 Milind Govekar Cameron Haight Donna Scott Debra Curtis Kris Brittain Ronni J. Colville Patricia Adams Alexander Linden	Server Tools capable of configuration and version management, asset management, and dynamic provisioning will mature and become more widely deployed. Extensible Markup Language will be extensively used to exchange information between different network and system management tools. Software tools to manage the availability and performance of applications from an end-user perspective will be commonly used in the enterprise. Time Frame: 2004-2005 Confidence Level: 0.9	Web Services Management tools to manage both Web Services Applications and the underlying Platforms proliferate. Time Frame: 2006-2007 Confidence Level: 0.8	Simple Network Management Protocol becomes obsolete, replaced by management protocols like Common Information Model (CIM) and Java Management Extensions (JME). Time Frame: 2008-2010 Confidence Level: 0.7

Technical Service	Description	Short-Term Forecast	Mid-Term Forecast	Long-Term Forecast
3.1.19 Operating Systems	Computing device enabling capabilities	<p>For the desktop, Windows continues to gain market share, Linux gains stability. Windows-based PCs will remain the dominant access device for corporate and consumer users. Linux is a practical option for small servers and on the desktop for workers who need a limited function appliance, or as a terminal replacement such as data entry workers. Linux's rapid maturation will be at the expense of Unix, replacing small servers.</p> <p>Time Frame: 2004-2005 Confidence Level: 0.9</p>	<p>Linux eats into market share on the desktop and in the small server area. Linux is used on the desktop for mainstream business users who have structured tasks or use office suite, packaged and line of business applications.</p> <p>Time Frame: 2006-2007 Confidence Level: 0.8</p>	<p>Linux becomes a reasonable Operating System (OS) choice for larger systems, including the mainframe, due to stability and improved scalability. Early attempts at building Multi-Level Security into (MLS) system still based on concept of authorization and access control to common files. Linux on the desktop is widely used by consumers.</p> <p>Time Frame: 2008-2010 Confidence Level: 0.8</p>
3.1.20 Physical Interface	Interface standards that provide the requirements for establishing a data interchange interface with physical resources.	<p>Serial Advanced Technology Attachment ATA and WiFi 802.11g interfaces provide significant performance improvement at no additional cost and become standard on new systems.</p> <p>Time Frame: 2004-2005 Confidence Level: 0.8</p>	<p>USB, Serial and Personal Computer Memory Card International Association (PCMCIA) devices that are able to read a cardholder's personal identity and company information in the smart card (ISO 7816 standard) become standard on corporate and government systems.</p> <p>Time Frame: 2006-2007 Confidence Level: 0.8</p>	<p>Wireless Universal Serial Bus, a new peripheral-to-PC connection technology over Ultrawideband technology, become available on new systems. Its benefits include wider penetration, higher transfer rate, lower cost, light power and backward compatibility.</p> <p>Time Frame: 2008-2010 Confidence Level: 0.8</p>

Technical Service	Description	Short-Term Forecast	Mid-Term Forecast	Long-Term Forecast
3.1.21 Product Data Interchange	<p>Service for transmitting computer aided data that describes information about components, subsystems or systems.</p> <p>Reference:</p> <p>Hype Cycle for Supply Chain Management, 2003 6 June 2003</p> <p>Karen Peterson David Hope-Ross Jeff Woods Andrew White</p>	<p>Product electronic data exchange, that has typically only been conducted on value added networks, begins to move to the Internet. Many medium size businesses employ Web-based EDI tools and the Internet to reduce costs. Electronic procurement systems are commoditized and common place.</p> <p>Time Frame: 2004-2005 Confidence Level: 0.8</p>	<p>Web based EDI transitions to the Web Services model -- standards based systems accessible over ubiquitous networks.</p> <p>Time Frame: 2006-2007 Confidence Level: 0.8</p>	<p>No major changes anticipated.</p> <p>Time Frame: 2008-2010 Confidence Level: 0.7</p>
3.1.22 Security Infrastructure	<p>Addresses standards for service areas providing overall security support. It includes, public key infrastructure, intrusion detection systems and security evaluation criteria.</p> <p>Reference:</p> <p>Hype Cycle for Information Security, 2003 30 May 2003</p> <p>Vic Wheatman Arabella Hallawell John Pescatore Richard D. Stiennon Ray Wagner John Girard Roberta J. Witty Kelly M. Kavanagh</p>	<p>Intrusion Detection Systems will become obsolete and the functionality will shift to firewalls.</p> <p>Time Frame: 2004-2005 Confidence Level: 0.9</p>	<p>PKI systems for authentication, encryption and digital signing will start to get widely deployed.</p> <p>Time Frame: 2006-2007 Confidence Level: 0.8</p>	<p>Trusted Computing Platforms for computing, including secure hardware and operating systems to protect information, will gain critical mass.</p> <p>Time Frame: 2008-2010 Confidence Level: 0.7</p>

Technical Service	Description	Short-Term Forecast	Mid-Term Forecast	Long-Term Forecast
3.1.23 Security Protocols	<p>Information Security Enabling capabilities.</p> <p>Reference:</p> <p>Hype Cycle for Information Security, 2003 30 May 2003</p> <p>Vic Wheatman Arabella Hallawell John Pescatore Richard D. Stiennon Ray Wagner John Girard Roberta J. Witty Kelly M. Kavanagh</p>	<p>AES to protect electronic information will replace DES, which is broken.</p> <p>Time Frame: 2004-2005 Confidence Level: 0.9</p>	<p>Enterprises that use the Triple DES (3DES) standard, which is hard to break built processor intensive, will switch to AES implementation as system upgrades permit the switch at low cost.</p> <p>Time Frame: 2006-2007 Confidence Level: 0.8</p>	<p>Encryption and key exchange technologies that are based on quantum physics principles emerge.</p> <p>Time Frame: 2008-2010 Confidence Level: 0.7</p>

Technical Service	Description	Short-Term Forecast	Mid-Term Forecast	Long-Term Forecast
3.1.24 Software Development	<p>Application development guidelines and standards.</p> <p>Reference:</p> <p>Hype Cycle for Application Development, 2003 30 May 2003</p> <p>Jim Duggan Michael J. Blechar Mark Driver Joseph Feiman Matt Light Theresa Lanowitz Jim Sinur Dale Vecchio Daniel B. Stang Jackie Fenn Alexander Linden Yefim V. Natis Whit Andrews</p>	<p>Agile application development methodologies such as RAD and XP become conventional; Software Change and configuration Management tools are routinely part of standard business processes. Tools emerge that can generate business and technical architecture compliant J2EE and .NET software code. Rules based application development re-emerges and proliferates for larger business applications, with rules engines integrating with other elements of the of the enterprise architecture. New tools will allow business analyst to be directly involved in the creation and maintenance of these rules. Web Services that conform to core Web Services standards such as Simple Object Access Protocol (SOAP) and Business Process Execution Language (for Web Services) (BPEL) emerge in the enterprise. Web services become secure and are resistant to hacking.</p> <p>Time Frame: 2004-2005 Confidence Level: 0.9</p>	<p>Automated functional and regression tools are routinely used. Applications routines include a component for deployment on mobile devices. Performance testing is conducted throughout the lifecycle of application development efforts, including post deployment. Basic Web services standards are well defined and commonly in use. Microsoft's .NET platform will close the gap with J2EE and become a viable integration platform. Sophisticated tools that help migrate legacy application to modern architectures emerge. Project Management tools collect metrics from resource management applications.</p> <p>Time Frame: 2006-2007 Confidence Level: 0.8</p>	<p>Unified Modeling Language (UML) is enhanced and becomes the de facto standard for representing object oriented designs. Technologies for modularizing cross-cutting aspects of a system emerge as a logical extension of the object-oriented paradigm. Linking of leading Business Process Analysis tools and architecture based code generators will create Integrated suites of tools that are able to significantly automate development of business architecture compliant applications.</p> <p>Time Frame: 2008-2010 Confidence Level: 0.7</p>

Technical Service	Description	Short-Term Forecast	Mid-Term Forecast	Long-Term Forecast
3.1.25 Storage	A set of storage standards enables the persistent storage, protection, and retrieval of data and information. Storage provides both storage architecture and storage area management, including operations and capacity management.	Both Network-Attached Storage and Storage-Area Networks architectures are appropriate in different parts of the GIG. iSCSI, IP, and emerging 10Gb Ethernet will interconnect and coexist with FC in Storage Area Network (SAN) backbones. Storage management automation, standards, and process will remain immature. Time Frame: 2004-2005 Confidence Level: 0.9	Network-Attached Storage and Storage-Area Networks converge and Network-Attached Storage is incorporated into Storage-Area Network. Maturing network storage management tools will enable 4x+ improvements in storage administrator efficiencies Time Frame: 2006-2007 Confidence Level: 0.8	Wide-Area Storage-Area Networks routinely use extended Fibre Channel Storage-Area Networks with underlying SONET or SDH technology Time Frame: 2008-2010 Confidence Level: 0.7
3.1.26 Style Guides	Design rules and guidelines for the look and behavior of the user interaction with a software application or a family of software applications. Reference: Hype Cycle for Human-Computer Interaction, 2003 30 May 2003 Jackie Fenn Alexander Linden	No fundamental changes, normal incremental updates expected. Time Frame: 2004-2005 Confidence Level: 0.9	Style guides begin to codify rules for somewhat niche human-computer interaction areas such as handwriting, natural language, and speech. Time Frame: 2006-2007 Confidence Level: 0.8	Style guides begin to address wearable computers. Time Frame: 2008-2010 Confidence Level: 0.7

Technical Service	Description	Short-Term Forecast	Mid-Term Forecast	Long-Term Forecast
3.1.27 Sub-networks	<p>Standards needed to access sub-networks.</p> <p>Reference:</p> <p>Hype Cycle for Networking and Communications, 2003 30 May 2003</p> <p>Bob Hafner Ian Keene Patti A. Reali Drew Kraus Bern Elliot Phillip Redman Richard D. Stiennon Bettina Tratz-Ryan Nick Allen</p>	<p>Multi Protocol Label Switching (MPLS), which allows for prioritization of traffic and traffic policy enforcement, is widely deployed. MPLS services become commercially available. This also assists Application Service Providers to provide corporate applications management.</p> <p>Time Frame: 2004-2005 Confidence Level: 0.9</p>	<p>IP telephony, including VoIP and VoIP over cable, become standard and replace corporate PBXs.</p> <p>Time Frame: 2006-2007 Confidence Level: 0.8</p>	<p>IPv6 is rolled out on a large scale as applications that can leverage the IPv6 quality of service and security services become desirable.</p> <p>Time Frame: 2008-2010 Confidence Level: 0.7</p>
3.1.28 Transmission	<p>Transmission media used to transmit information from one location to another location. Includes satellite communications, radio communications, and synchronous optical network transmission.</p>	<p>Dense wave division multiplexing enables multiple wavelengths of light to be placed on a single optical fiber, increases the capacity of the fiber by the number of wavelengths. State of the technology - 160 wavelengths. This means lower cost, higher capacity bandwidth.</p> <p>Time Frame: 2004-2005 Confidence Level: 0.9</p>	<p>Multimegabit Next-Generation (NG) satellite services means even lower cost, higher bandwidth. Optical switches, rather than electrical switches, proliferate in dense wave division multiplexing; which means lower-cost infrastructure and operation.</p> <p>Time Frame: 2006-2007 Confidence Level: 0.8</p>	<p>The transmission of broadband traffic over the power line infrastructure expand coverage and reduce costs for telecom services through the reuse of the established power line infrastructure. The mplementation of fiber-optic cable to the desktop means new business opportunities.</p> <p>Time Frame: 2008-2010 Confidence Level: 0.7</p>

Technical Service	Description	Short-Term Forecast	Mid-Term Forecast	Long-Term Forecast
3.1.29 User Assistance	Set of standards that enable person-related accessibility and user-oriented smart agents. User Assistance (UA) services are automated capabilities that learn and apply user preferences and patterns to assist users to efficiently and effectively utilize GIG resources in the performance of tasks.	The Search Engine market continues to see new entrants driving innovations, price pressure, and variety and there is no clear dominant leader. Time Frame: 2004-2005 Confidence Level: 0.8	Vendors develop more modular architectures that are not constrained to documents as their central focus. Time Frame: 2006-2007 Confidence Level: 0.8	Search Engines have the ability to call on applications for the results of logical queries. And with an alert notify users when new content is published or results received. Time Frame: 2008-2010 Confidence Level: 0.7
3.1.30 Video Teleconferencing	Standards for the transmission of video data Reference: Hype Cycle for E-Workplace Technologies, 2003 6 June 2003 Simon Hayward French Caldwell Gene Phifer Mark R. Gilbert Toby Bell Diane Morello Drew Kraus Bern Elliot Debra Logan George J. Weiss Maurene Caplan Grey Lou Latham Whit Andrews Michael Bell Karen M. Shегда	Web Conferencing will augment, and sometimes replace, Video conferencing to support distributed meetings. Time Frame: 2004-2005 Confidence Level: 0.9	Unified communications standards will mature and be widely used for conferencing. Time Frame: 2006-2007 Confidence Level: 0.8	Desktop video conferencing will often be practical, but bandwidth issues will still be a limiting factor. Time Frame: 2008-2010 Confidence Level: 0.7

Technical Service	Description	Short-Term Forecast	Mid-Term Forecast	Long-Term Forecast
3.1.31 Web Services	<p>Standards supporting the implementation and operations of web services based applications and capabilities</p> <p>Reference:</p> <p>Hype Cycle for Web Services, 2003 30 May 2003</p> <p>Whit Andrews David Mitchell (NH) Smith Benoit Lheureux Cameron Haight Daryl C. Plummer Larry Perlstein Michele Cantara</p>	<p>Web Services that conform to core Web Services standards such as SOAP and BPEL emerge in the enterprise.</p> <p>Time Frame: 2004-2005 Confidence Level: 0.9</p>	<p>Basic Web services standards are well defined and commonly in use. Web services become secure and are resistant to hacking. Electronic Business Extensible Markup Language (ebXML) Collaboration Protocol Profiles and Agreements require substantial vertical development as various industries describe a means of semantic-driven formatting.</p> <p>Time Frame: 2006-2007 Confidence Level: 0.8</p>	<p>New Web-Services based business models emerge.</p> <p>Time Frame: 2008-2010 Confidence Level: 0.7</p>
3.1.32 Wireless LAN	<p>Wireless data network enabling services.</p> <p>Reference:</p> <p>Hype Cycle for Mobile and Wireless Networking, 2003 30 May 2003</p> <p>Phillip Redman Ken Dulaney William Clark</p>	<p>Wi-Fi 802.11g will be the de facto WLAN standard.</p> <p>Time Frame: 2004-2005 Confidence Level: 0.9</p>	<p>Broadband Wireless access, using disparate underlying technologies such as cellular and time division multiplexing, will proliferate.</p> <p>Time Frame: 2006-2007 Confidence Level: 0.8</p>	<p>Global System for Mobile (GSM) will be upgraded to use WCDMA, and comply with the 3G wireless technology standard.</p> <p>Time Frame: 2008-2010 Confidence Level: 0.7</p>

Technical Service	Description	Short-Term Forecast	Mid-Term Forecast	Long-Term Forecast
3.1.33 XML Technologies	<p>Foundational W3C specifications, foundational Web computing standards and key vertical standards - all expressed in XML.</p> <p>Reference:</p> <p>Hype Cycle for XML Technologies, 2004 16 June 2004</p> <p>ID Number: G00120920</p>	<p>SOAP and WSDL are widely used. Security Assertions Markup Language (SAML) (and the Liberty Alliance specification, which is based on SAML) is the de facto standard for federated identity initiatives.</p> <p>Time Frame: 2004-2005 Confidence Level:</p>	<p>Financial accounting software incorporates Extensible Business Reporting Language (XBRL). Regulatory and transparency pressures increase the significance and likelihood of XBRL adoption. XForms is more powerful than HTML forms, which are ubiquitous. As XForms demonstration products move into production, its use should dramatically increase. Security standards for XML-based Web services (XML Encryption, XML digital signatures, XKMS, SAML, Extensible Rights Markup Language (XrML), Extensible Access Control Markup Language (XACML), Service Provisioning Markup Language (SPML) and Web Service (WS)-Security) are in wide use.</p> <p>Time Frame: 2006-2007 Confidence Level: 0.8</p>	<p>UDDI is used to organize directories of Web services. Enterprises use it to develop directories that enable them to store, locate and retrieve internally developed or externally sourced Web services.ebXML consolidates with UDDI to gain wide acceptance. ebXML Collaboration Protocol Profiles and Agreements requires substantial vertical development as various industries describe a means of semantic-driven formatting. SPML shows great promise but is only in an early stage of development.</p> <p>Time Frame: 2008-2010 Confidence Level: 0.7</p>

3.2 Old Forecasts

Table 3-2, Old Forecasts, lists the various technical services, their descriptions, and the details of the old forecasts.

Table 3-2, Old Forecasts

Technical Service	Description	Short Term Forecast	Mid Term Forecast	Long Term Forecast
3.2.1 Architectures	<p>Architecture is a set of guidelines, policies, and processes for building out computer systems. It is also a blueprint - a schematic way to communicate design ideas, provide workers with specifications, and track progress. Architecture is a common vehicle of communication for people building and modifying enterprise computing systems.</p> <p>Reference: Gartner: The New Enterprise Architecture: Wiring for Speed, Jeff Schulman</p>	<p>E-business architectures converge onto a hand full of standards. Architectures support all the various business design and application hosting patterns for CRM, ERP.</p> <p>Time Frame: 2003 Confidence Level: 0.9</p>	<p>E-business architectures begin to ingest portions of CRM and ERP, although back-office continues to house master systems synchronized with web-based equivalents in a real time and online manner. Portals and n-tiered architectures the norm.</p> <p>Architectures grow to support well-defined integration patterns and the coexistence of major systems like Systems, Applications and Products (SAP), Oracle, JD Edwards, Siebel, PeopleSoft.</p> <p>Time Frame: 2004-2005 Confidence Level: 0.7</p>	<p>Standardized large-system architectures. As-yet unknown new techniques come forth to vie with n-tiered architectures.</p> <p>Integration architecture coupled with a SOA becomes widespread.</p> <p>Most vendors expose their application functions as services.</p> <p>Time Frame: 2006+ Confidence Level: 0.9</p>

Technical Service	Description	Short Term Forecast	Mid Term Forecast	Long Term Forecast
3.2.2 Authentication	Standards used to authenticate the identity of system users, or transactions	<p>Competing systems, difficulties dealing with legacy systems.</p> <p>Organizations will continue to deal with application dependent authentication systems. Attempts to better centralize the authentication process across applications will progress, but difficulties will remain since proprietary applications will require custom interface development, thus preventing any significant single sign-on functionality. Organizations will continue to experiment with new authentication methods such as biometrics, smart cards, etc., but high cost-of-entry will keep most from deploying enterprise-wide solutions.</p> <p>Time Frame: 2003 Confidence Level: 0.8</p>	<p>Wrappers developed for legacy systems, still competing systems, more based on Lightweight Directory Access Protocol (LDAP) directories. New technologies will enable organizations to better interface proprietary, legacy applications with central authentication directories. The maturation and competition of programming languages and standards APIs will enable organizations to more easily interface with standard systems such as LDAP, and newer technologies such as biometrics. Systems will continue to be username and password-based due to a continued high cost-of-entry for more advanced solutions in the two to four year term, but organizations will begin to deploy the solutions for limited, high-security applications.</p> <p>Time Frame: 2004-2005 Confidence Level: 0.8</p>	<p>Still problems with legacy systems, progress made, still proprietary. Centralized authentication systems will become much more prominent as fewer applications exist that require custom interfaces. Single sign-on will become more realistic as a result. These centralized systems will evolve to support multiple authentication types that can easily change between users and applications. This will enable organizations to Better deploy alternative solutions in phases that are easier to manage.</p> <p>Biometric technology and infrastructure matures, and will be used to support identity assurance with implementation of DoD Enterprise Biometric Solution.</p> <p>Public Key Infrastructure (PKI) needs to take on Community of Interest (COI) role in order to become effective for single logon and tunneling.</p> <p>Time Frame: 2006+ Confidence Level: 0.7</p>

Technical Service	Description	Short Term Forecast	Mid Term Forecast	Long Term Forecast
3.2.3 Autonomic Computing	<p>An approach to self-managed computing systems with a minimum of human interference. The term derives from the body's autonomic nervous system, which controls key functions without conscious awareness or involvement.</p> <p>Reference:</p> <p>http://www.research.ibm.com/autonomic/glossary.html#ac</p>	<p>Currently, Grid is a type of autonomic computing environment and it is very widely deployed with 2 million PCs around the world. Many companies are currently deploying server solutions and software solutions, which can self-heal upon failures. International Business Machines (IBM) Corporation has already developed server blades, which can self-heal in the event of failures.</p> <p>Time Frame: 2003 Confidence Level: 0.9</p>	<p>Autonomic computing will continue to develop both in terms of hardware and software. In addition, government is requiring various companies to follow a lot of security standards for both the internet and the intranet. Also, the idea of utility computing is going to be developed further using the ideas of autonomic computing. Currently, many service providers such as Storage Service Providers, Network Service Providers etc... have already developed.</p> <p>Time Frame: 2004-2005 Confidence Level: 0.9</p>	<p>The number of users and amount of hardware continues to grow. In addition, there is a good level of computing surge and power surge based upon Moore's law, but the need for computing power grows at the same level.</p> <p>In addition, the number of skilled IT professionals and the associated costs will push companies to buy products which are more autonomic, self-healing and self-protecting. Currently major companies are pushing for developing systems that can make decisions based upon priorities and policies, and aid in providing the e-sourcing or e-utility model.</p> <p>Time Frame: 2006+ Confidence Level: 0.8</p>

Technical Service	Description	Short Term Forecast	Mid Term Forecast	Long Term Forecast
3.2.4 Biometric Technology Services	"User authentication and access based upon recognition of physical characteristics"	<p>Technologies such as fingerprint and facial recognition continue to have a market fascination, but the high cost-of-entry due to hardware costs and infrastructure modifications will detract most organizations. Some organizations will deploy pilots, but the subsequent unsatisfactory results will prevent any substantial production deployments except in very high security facilities.</p> <p>Time Frame: 2003 Confidence Level: 0.9</p>	<p>Other technologies such as iris scanning and voice recognition will emerge as competition, but the cost-of-entry will continue to be high for many organizations. Fingerprint and hand geometry will emerge as the dominant technology due to market maturity, with satisfactory pilots leading some organizations to begin limited deployments for internal purposes.</p> <p>Time Frame: 2004-2005 Confidence Level: 0.7</p>	<p>Infrastructure improvements and centralized authentication functions will allow more organizations to deploy biometric solutions. Consumer solutions will emerge, but user confusion will continue to stagnate large-scale deployments.</p> <p>Time Frame: 2006+ Confidence Level: 0.7</p>

Technical Service	Description	Short Term Forecast	Mid Term Forecast	Long Term Forecast
3.2.5 Business Activity Monitors	<p>Business activity monitoring (BAM) refers to the real-time monitoring of business metrics and to the process for issuing alerts when problems or opportunities arise.</p> <p>Reference:</p> <p>Gartner: Digging Deeper Into Business Activity Monitoring, Note Number: LE-20-4494</p>	<p>More enterprises become aware of Business Activity Monitors (BAM) and look for scenarios where it may provide value as BAM vendors increase marketing activities.</p> <p>Time Frame: 2003 Confidence Level: 0.9</p>	<p>Large integration software vendors buy some BAM vendors. BAM vendors increase efforts on analytical engines behind the dashboard or provide better hooks for separate analytical engines.</p> <p>BAM Vendors align themselves with large middleware providers and products.</p> <p>Time Frame: 2004-2005 Confidence Level: 0.9</p>	<p>Enhanced analytic engines used for event pattern analysis. This will cause more attention to be focused on data mining tools. Increased focus on pulling in events external to the enterprise via knowledge mining and filtering software.</p> <p>Time Frame: 2006+ Confidence Level: 0.7</p>

Technical Service	Description	Short Term Forecast	Mid Term Forecast	Long Term Forecast
3.2.6 Business Process Management	<p>Business Process Management (BPM) is the general term for the services and tools that support explicit process management (such as process analysis, definition, execution, monitoring and administration), including support for human and application-level interaction. In its strictest sense, workflow means the combination of tasks that define a process. BPM implies the generic concept of workflow; however, complete BPM must minimally contain human-to-human flow. BPM may include, but is not limited to, system-to-system flow automation.</p> <p>Reference:</p> <p>Gartner: A BPM Taxonomy: Creating Clarity in a Confusing Market, Note Number: T-18-9669</p>	<p>Business Process Management (BPM) and Workflow converging. Legacy workflow engines evolve to support new technologies like web services. Web Services Flow Language (WSFL) released.</p> <p>Time Frame: 2003 Confidence Level: 0.9</p>	<p>BPM standards such as Business Process Execution Language for Web Services (BPEL4WS) begin to make their way into the products. Better integration with Enterprise Application Integration (EAI) and B2B integration brokers. Better process modeling and simulation capabilities (design time feature). Niche vendors with good products continue to be bought out by larger integration vendors looking for this piece of the EAI stack.</p> <p>Time Frame: 2004-2005 Confidence Level: 0.8</p>	<p>Greater adoption, particularly as more are packaged as a standard part of the EAI product suite. Continued work on storing process definitions in a standard format.</p> <p>Time Frame: 2006+ Confidence Level: 0.8</p>

Technical Service	Description	Short Term Forecast	Mid Term Forecast	Long Term Forecast
3.2.7 Business-to-Business Integration Servers	Server suites that enable the exchange of information between trading partners	<p>Additional start-up packs offered for new B2B standards. B2B Gateways continue to be standalone products. Companies with funding to invest will create combined EAI and B2B servers.</p> <p>Time Frame: 2003 Confidence Level: 0.9</p>	<p>Better integration with EAI integration brokers and BPM tools. Playing field of products continues to shrink as concepts and technologies mature and converge. Boundaries between EAI and B2B overlap. Companies realize that application integration between internal organizations is a form of B2B and that this integration benefits from the discipline of treating data exchanges and Business Process sharing as a form of B2B.</p> <p>Time Frame: 2004-2005 Confidence Level: 0.9</p>	<p>Greater adoption, particularly as more BPM features become packaged as a standard part of the EAI product suite.</p> <p>Time Frame: 2006+ Confidence Level: 0.8</p>
3.2.8 CORBA	Common Object Request Broker Architecture (CORBA) is an Object Management Group specification which provides the standard interface definition between compliant objects	<p>The Common Object Request Broker Architecture (CORBA) continues to vie with message-based middleware. New Legacy status.</p> <p>Time Frame: 2003 Confidence Level: 0.7</p>	<p>Presence and use wanes as message-based middleware, Java, Enterprise Java Beans, and loose coupling begin to dominate.</p> <p>Time Frame: 2004-2005 Confidence Level: 0.9</p>	<p>No longer dominant.</p> <p>Time Frame: 2006+ Confidence Level: 0.9</p>

Technical Service	Description	Short Term Forecast	Mid Term Forecast	Long Term Forecast
3.2.9 Data Mining	<p>Data mining refers to a process rather than a technology, with the goal of discovering new correlations, trends, patterns, relationships, and categories. That is accomplished by sifting through large amounts of data, using pattern recognition technologies as well as statistical and mathematical techniques.</p> <p>Reference:</p> <p>Gartner: Management Update: Data Mining Trends Enterprises Should Know About, Note Number: IGG-10092002-02</p>	<p>Data mining remains a niche market/capability, confined to data-intensive or data-centric commercial enterprises.</p> <p>Vendor-developed data mining tools continue to center on serving unique CRM requirements.</p> <p>Time Frame: 2003 Confidence Level: 0.9</p>	<p>Vendor acceptance of and adherence to data exchange and analysis standards such as XML for Analysis (XMLA) and Predictive Model Markup Language (PMML) broadens, but not to the point of universal acceptance and ubiquity. Interoperability is impeded because many vendors and data sources continue to adhere to proprietary data formats and standards.</p> <p>Data mining use broadens very modestly, mainly through the embedding of application-specific data mining tools. Robust data mining capabilities continue to represent a small part of the market.</p> <p>Time Frame: 2004-2005 Confidence Level: 0.8</p>	<p>Data exchange and analysis standards (e.g., XMLA and PMML) approach, but do not achieve, status as generally accepted 'best practice'. Data mining use continues modest growth through embedded application-specific data mining tools, aided by spreading acceptance of data exchange standards. Robust data mining remains a niche capability, confined to large, data-centric enterprises. Some enterprises consider outsourcing their data mining to companies that spring up to serve this niche market.</p> <p>Time Frame: 2006+ Confidence Level: 0.6</p>

Technical Service	Description	Short Term Forecast	Mid Term Forecast	Long Term Forecast
3.2.10 Data Visualization (for visualizing patterns in large datasets)	Graphical techniques that are used to plot large amounts of highly complex data. This enables trained users to get a quick overview.	<p>Supplementing other analytical technologies. Already used to simplify output of data mining processes. Quality of commodity monitors lowers cost of entry for data visualization tools.</p> <p>Largely used for the review of historical business data.</p> <p>Time Frame: 2003 Confidence Level: 0.9</p>	<p>Increased use in enhancing Business Activity Modeling (BAM) dashboard displays.</p> <p>Organizations will begin to experiment with near real-time implementation as bandwidth in production data centers allow. Will then expand beyond business data to include network and security visualizations.</p> <p>Time Frame: 2004-2005 Confidence Level: 0.7</p>	<p>Bandwidth increases along with display and processing improvements will empower large organizations to begin piloting real-time views in 5-8 years. Dependent on companies investing in high quality systems and vendors.</p> <p>Time Frame: 2006+ Confidence Level: 0.6</p>

Technical Service	Description	Short Term Forecast	Mid Term Forecast	Long Term Forecast
3.2.11 Data Warehousing	<p>A data warehouse is a consolidated view of enterprise data, optimized for reporting and analysis. It is an aggregated, sometimes summarized copy of transaction and non-transaction data specifically structured for dynamic queries and analytics.</p> <p>Reference:</p> <p>http://www.informationbuilders.com/definition/data-warehousing.html</p>	<p>Data Warehouses (DWs) used in combination with Business Intelligence Tools, BI (T), will help to analyze and measure elapsed times in the cross-enterprise processes that the Real Time Enterprise (RTE) seeks to improve. The big players in Data Warehousing will continue to grow products and market share while small players continue to fall by the wayside.</p> <p>Time Frame: 2003 Confidence Level: 0.9</p>	<p>DWs will move from the slope of emerging technology to a plateau. The real-world benefit of Data Warehousing technology will be demonstrated and accepted.</p> <p>Time Frame: 2004-2005 Confidence Level: 0.8</p>	<p>Tools and methodologies of DWs will be increasingly stable as they begin to enter their second and third generation of life.</p> <p>DWs will become commonplace in both the commercial and government market.</p> <p>Time Frame: 2006+ Confidence Level: 0.8</p>

Technical Service	Description	Short Term Forecast	Mid Term Forecast	Long Term Forecast
3.2.12 Databases	<p>A database is a collection of data that is organized so that its contents can easily be accessed, managed, and updated. The most prevalent type of database is the relational database, a tabular database in which data is defined so that it can be reorganized and accessed in a number of different ways. A distributed database is one that can be dispersed or replicated among different points in a network. An object-oriented programming database is one that is congruent with the data defined in object classes and subclasses.</p> <p>Reference:</p> <p>http://whatis.techtarget.com/definition/0,289893,sid9_gci211895,00.html</p>	<p>Relational dominates market share. Object Oriented (OO) vendors continue to vie for XML storage niche. XML Application Programming Interfaces (API) exists in most relational databases. Relational Database Management System (RDBMS) vendors continue adding data warehousing functionality. Support for unstructured data storage and retrieval becoming more robust.</p> <p>Time Frame: 2003 Confidence Level: 0.9</p>	<p>Commercial Off The Shelf (COTS) packages provide less direct exposure to databases and increase in deployment of operational data stores and data warehouses to gain access to the data. RDBMS vendors enhance large object storage and retrieval mechanisms.</p> <p>More self-tuning features added. Stalwart RDBMSs such as Oracle and Database 2 (DB2) provide extensive support for native XML storage, querying, and retrieval.</p> <p>Time Frame: 2004-2005 Confidence Level: 0.9</p>	<p>More new data is stored in XML especially when there is value to store documents in original format--majority will be stored in relational and older formats. Data is stored in both XML and relational format based on usage, access and performance requirements.</p> <p>Full support for XQuery in major RDBMSs.</p> <p>Time Frame: 2006+ Confidence Level: 0.9</p>

Technical Service	Description	Short Term Forecast	Mid Term Forecast	Long Term Forecast
3.2.13 Digital Signatures	<p>Public key cryptography based signature in electronic form, attached to, or logically associated with, an electronic record.</p> <p>Reference:</p> <p>Gartner: E-Signatures-- Digital and Electronic: Technology Overview, Note Number: DPRO-91585</p>	<p>Digital signatures have become increasingly ready for deployment, but the complexities and costs of a PKI implementation are still preventing significant investments in 2003.</p> <p>Time Frame: 2003 Confidence Level: 0.9</p>	<p>The commercial market will have adopted the PKI/Digital Signature Infrastructure. The need for increased security will cause the Government to leverage PKI, Smart Cards, Public Key Enabling (PKE), and Digital Signature.</p> <p>Focused experimentation and solid hard work by an increasingly diverse range of organizations will lead to a true understanding of the technology's applicability, risks and benefits. COTS methodologies and tools will become available to ease the development process and application integration.</p> <p>Time Frame: 2004-2005 Confidence Level: 0.9</p>	<p>Digital Signatures will become an improved process enabler with a vast business penetration. Industry leaders will adopt this technology, and digital signatures will have a major effect across industries.</p> <p>Digital signatures will provide the industry with better user interfaces, easier information access, and improved customer service.</p> <p>Time Frame: 2006+ Confidence Level: 0.8</p>
3.2.14 Displays	Display Technologies to Watch	<p>Flat panel continues to improve and fall in price; prices stabilize as demand grows.</p> <p>Time Frame: 2003 Confidence Level: 0.9</p>	<p>Cathode Ray Tubes (CRT) becomes obsolete as flat panel size increases; production meets demand. Displays become commodities.</p> <p>Time Frame: 2004-2005 Confidence Level: 0.7</p>	<p>Flat panel durability improves, size increases, 24-inch standard, High Definition Television (HDTV) aspect ratio becomes standard.</p> <p>Time Frame: 2006+ Confidence Level: 0.7</p>

Technical Service	Description	Short Term Forecast	Mid Term Forecast	Long Term Forecast
3.2.15 Enterprise Management	<p>Enterprise-wide system management. Could include application server management, help desk management, storage resource management, enterprise backup, event management and desktop software distribution.</p> <p>Reference:</p> <p>Gartner: Magic Quadrants Highlight Enterprise Management Markets, Note Number: AV-20-1852</p>	<p>Competing proprietary architectures requiring agents and software plug-ins. Enterprise Management (EM) only used for very large operations centers and n-tier applications. Business Case for exploiting EM is well known in these circumstances.</p> <p>Time Frame: 2003 Confidence Level: 0.9</p>	<p>More large software products, such as web-services, come with their own agents (plug-ins) for most common EM systems. Grid and Autonomic Computing drive standardization, which is key to consistent Enterprise Management.</p> <p>Time Frame: 2004-2005 Confidence Level: 0.8</p>	<p>EM interfaces standardized and secure, many operating systems come with EM interface capability built-in, nearly all large software systems so equipped.</p> <p>Time Frame: 2006+ Confidence Level: 0.8</p>

Technical Service	Description	Short Term Forecast	Mid Term Forecast	Long Term Forecast
3.2.16 Executive Dashboard	<p>Scorecard application, with important corporate metrics representing the many facets of business operations.</p> <p>Reference:</p> <p>Gartner: Case Study: The Politics of Business Intelligence, Note Number: CS-18-1457</p>	<p>Executive dashboards are implemented only in technologically advanced organizations with established data aggregation processes already in place.</p> <p>Time Frame: 2003 Confidence Level: 0.5</p>	<p>The cost of implementing executive dashboards marginally decreases as open-standard data transport languages become more widely implemented.</p> <p>Enterprise-wide data consolidation efforts improve in timeliness and accuracy as technologies improve and organizations gain a more accurate understanding of the data elements that are collected by their transactional systems. These efforts increase the number of organizations that could feasibly implement an executive dashboard.</p> <p>Time Frame: 2004-2005 Confidence Level: 0.7</p>	<p>Executive dashboards become accepted as a common tool available to facilitate proactive leadership of an organization.</p> <p>The cost of implementation continues to decrease and the number of organizations using commercially available applications reaches critical mass.</p> <p>Time Frame: 2006+ Confidence Level: 0.7</p>

Technical Service	Description	Short Term Forecast	Mid Term Forecast	Long Term Forecast
3.2.17 eXtensible Business Reporting Language (XBRL)	<p>A specification for publishing financial information in the XML format. It is designed to provide a standard set of XML tags for exchanging accounting information and financial statements between companies and analysts.</p> <p>Reference:</p> <p>http://www.techweb.com/encyclopedia/defineterm?term=xbrl&x=24&y=9</p>	<p>Extensible Business Reporting Language (XBRL) is still an emerging technology, but support by the American Institute of Certified Public Accountants (AICPA) and major technology vendors should encourage adoption.</p> <p>Time Frame: 2003 Confidence Level: 0.9</p>	<p>Use of XBRL by regulators like the Federal Deposit Insurance Information (FDIC) and the United Kingdom (UK) Inland Revenue will begin to drive adoption through industry.</p> <p>Leading banks will be using XBRL for collecting credit information from their customers, also encouraging adoption.</p> <p>Time Frame: 2004-2005 Confidence Level: 0.7</p>	<p>XBRL will become the de facto standard for producing and analyzing financial reports. The Securities and Exchange Commission (SEC) and the Education Department Grants Administration Regulation (EDGAR) systems will accept XBRL as an optional filing format.</p> <p>Time Frame: 2006+ Confidence Level: 0.8</p>

Technical Service	Description	Short Term Forecast	Mid Term Forecast	Long Term Forecast
3.2.18 Fault Tolerance	<p>Fault tolerance provides additional resources that allow an application to "ride through" a hardware failure without interruption. A fully fault-tolerant solution requires that all the resources that the application is dependent on be replicated including the application process itself. As a result of this complete hardware and process replication, fault-tolerant systems are significantly more expensive than highly available systems.</p> <p>Reference: High Availability: A Perspective, Note Number: DPRO-90193</p>	<p>Fault tolerance features to support clustering are available for higher-end operating systems and servers.</p> <p>Time Frame: 2003 Confidence Level: 0.9</p>	<p>Crash recovery features become standard in Unix and Linux. Windows remains a consumer-level operating system, although Windows for servers sees some progress.</p> <p>Time Frame: 2004-2005 Confidence Level: 0.8</p>	<p>Crash recovery features become more bulletproof for Unix and Linux. Windows still plagued with instability at consumer level with incremental increases in server-level software stability due to market demand.</p> <p>Autonomic computing has matured and systems have self-healing features.</p> <p>Time Frame: 2006+ Confidence Level: 0.8</p>

Technical Service	Description	Short Term Forecast	Mid Term Forecast	Long Term Forecast
3.2.19 Financial Consolidation	An operational business intelligence application.	<p>Financial Consolidation continues to be an eminent process to financial statement preparation.</p> <p>The approach to financial consolidation continues to be improved on, through a higher degree of automation. XML begins to be a supported interchange language by ERP and other subsidiary systems.</p> <p>Agencies, bureaus, and departments begin to automate consolidation with the use of middleware, such as XML.</p> <p>Metadata depositories growth realized.</p> <p>Time Frame: 2003 Confidence Level: 0.8</p>	<p>Most ERP and other subsidiary systems support XML.</p> <p>Agencies, bureaus, and departments continue to automate consolidation (mapping improves) with the use of middleware, such as XML.</p> <p>Metadata depositories growth realized, approximately 80% complete per depository.</p> <p>Elimination process is substantially automated and formally documented.</p> <p>Financial consolidation will see partial real-time results.</p> <p>Time Frame: 2004-2005 Confidence Level: 0.9</p>	<p>Real-time financial consolidation is achieved. Government reporting accuracy is at all time high. Budgeting decisions handled at an increasingly real-time pace.</p> <p>Drill-down capabilities improve, along with financial consolidation audit trails.</p> <p>Time Frame: 2006+ Confidence Level: 0.8</p>

Technical Service	Description	Short Term Forecast	Mid Term Forecast	Long Term Forecast
3.2.20 GIS & Geospatial Data Interchange	<p>Computer systems capable of assembling, storing, manipulating and displaying data according to its location.</p> <p>Reference:</p> <p>Gartner: Hype Cycle for Utility Technologies, 2003, Note Number: R-20-0834</p>	<p>Still stand-alone products, yet concepts and technologies clearly coming of age. A good example is the use of this data in mapping software made available to the general public. Integrated Geographic Information Systems (GIS) technologies make asset tracking and data sharing among departments a reality.</p> <p>Time Frame: 2003 Confidence Level: 0.8</p>	<p>Integration into web applications and web servers as enablers. Both commercial and government agencies exploit GIS technology to establish themselves as integrated enterprises and to inter-operate.</p> <p>Time Frame: 2004-2005 Confidence Level: 0.7</p>	<p>Ability to generate dynamic maps, which can interact with user in real time.</p> <p>Businesses manage information about sales, customers, inventory, demographic profiles, mailing lists, and much more. At the core of this information is an address, a service boundary, a sales territory, or a delivery route that can be illustrated and interactively managed on a map.</p> <p>Information is tied to specific locations on interactive maps, to identify patterns and understand relationships not apparent from static tables and charts.</p> <p>Time Frame: 2006+ Confidence Level: 0.7</p>

Technical Service	Description	Short Term Forecast	Mid Term Forecast	Long Term Forecast
3.2.21 Grid Computing	<p>A Computing Grid is a collection of multiple computers from several owners to run one large application problem. Scientific Grids are typically used to solve the large-scale problems found in scientific and engineering computing. Commercial Grids refers to those computing grids that are formed for non-scientific, non-technical tasks to address a single, large scale purpose.</p> <p>References:</p> <p>Gartner, Hype Cycle for Emerging Technologies, 2003; Note Number: R-20-4160</p> <p>Giga, The Next Big Thing: Grid Computing, Stacey Quandt -- March 4, 2002</p> <p>Gartner, RTE Key Technologies and Applications Hype Cycle; Note Number: COM-18-6919</p>	<p>Researchers have shared access to the enormous data of the human genome through a grid. The U.S. National Science Foundation has funded the National Partnership for Advanced Computational Infrastructure, which works with partners and affiliates to jointly pursue scientific research. There are many similar collaborations that tie together academia, laboratories and contractors in many disciplines. The common factor is the need for very high computing, data or collaboration across multiple organizations. Scientific Grids will continue to proliferate. Currently the largest grid, which is a Scientific Grid used to solve decoding issues for Search for Extraterrestrial Intelligence (SETI), is SETI@Home.</p> <p>Time Frame: 2003 Confidence Level: 0.9</p>	<p>With the significant movement towards creating open standards for information exchanges using Web Services, the ease of making web services and deploying them will continuously increase.</p> <p>Commercial Grid Architectures begin to be based on Web Services technology. The Grid Architectures will provide the “plumbing” that enables distributed resource management and services on demand through extensions to the Web Service Definition Language (WSDL). Also, many organizations like United States (US) Department of Energy and the Department of Defense will use Scientific Grids to aid in projects such as gene sequencing and to address issues such as bio-terrorism. Specific vertical scientific and technical grid applications will begin to evolve into commercial grid computing applications.</p>	<p>The number of people and hardware using Grid Computing continues to grow. In addition, there is a good level of computing surge and power surge based upon Moore's law but the need for computing power grows at the same level.</p> <p>Commercial Grid Computing is firmly based upon Web Services. Also, developments in government to develop Scientific Grids to solve various problems continues to grow. The support will also tend to grow in life science, bio-terrorism, computational grid and e-sourcing.</p> <p>Grid products for reducing the integration effort will become available, making it feasible for enterprises to replace some supercomputers with grid technology.</p> <p>Time Frame: 2006+ Confidence Level: 0.6</p>

Technical Service	Description	Short Term Forecast	Mid Term Forecast	Long Term Forecast
	<p>Gartner, Market Evolution Will Widen the Uses of Grids; Note Number: R-20-0813</p> <p>Gartner, Grid Computing Needs Work Before Widespread Commercial Use; Note Number: AV-19-4769</p>		<p>Time Frame: 2004-2005 Confidence Level: 0.7</p>	

Technical Service	Description	Short Term Forecast	Mid Term Forecast	Long Term Forecast
3.2.22 Intelligent Agents	Autonomous, decentralized software.	<p>Actively used in system management and security environments. Research projects explore new areas of applicability.</p> <p>Time Frame: 2003 Confidence Level: 0.9</p>	<p>Trusted mobile agents apply security updates and other application patches on all network systems to achieve robust, self-healing systems that are less susceptible to attack.</p> <p>Time Frame: 2004-2005 Confidence Level: 0.8</p>	<p>Agent society models become an accepted tool for testing new organizational strategies.</p> <p>Agents are trusted to negotiate binding agreements.</p> <p>Time Frame: 2006+ Confidence Level: 0.7</p>
3.2.23 Inter-process communications	Communication between Business Processes	<p>Many proprietary systems with vendor families remain. Cost of re-investing too high and Return on Investment (ROI) not good.</p> <p>XML emerging on the scene as preferred method of data communication.</p> <p>Time Frame: 2003 Confidence Level: 0.8</p>	<p>Largely XML-based, still proprietary interfaces.</p> <p>Time Frame: 2004-2005 Confidence Level: 0.9</p>	<p>Like C++, XML and XML-follow-on will begin to replace existing infrastructure. As performance XML based middleware improves and is accepted, use of proprietary inter-process communications vehicles will diminish through attrition. Bottom line: Queuing systems like Message Queuing (MQ) Series and Java Messaging will become commonplace.</p> <p>Time Frame: 2006+ Confidence Level: 0.9</p>

Technical Service	Description	Short Term Forecast	Mid Term Forecast	Long Term Forecast
3.2.24 Java and J2EE	<p>Java 2 Platform, Enterprise Edition (J2EE) is a Sun Microsystems-sponsored architecture specification that prescribes application architecture for Java-based business applications. J2EE is well-established as a platform for mainstream enterprise business applications.</p> <p>Gartner: Hype Cycle for Application Integration and Platform Middleware, 2003, Note Number: R-20-0814</p>	<p>Java 2 Enterprise Edition (J2EE) continues to evolve as standard of choice for designing and developing model view controller and tiered systems. Java becoming language of choice for new systems. Some buzz about C#.</p> <p>Time Frame: 2003 Confidence Level: 0.9</p>	<p>J2EE standardization and maturity. J2EE standard designing and development. Architecture and modeling tools capable of generating J2EE compliant systems.</p> <p>Time Frame: 2004-2005 Confidence Level: 0.8</p>	<p>J2EE firmly entrenched and aligned with Enterprise Architecture methods.</p> <p>Time Frame: 2006+ Confidence Level: 0.7</p>
3.2.25 Local Area Network Bandwidth	<p>The amount of data that can be sent between nodes in a local network, measured in bits per second</p>	<p>100BaseT becomes Local Area Network (LAN) standard 1000BaseT (Gigabit) for inter-switch wiring becoming common.</p> <p>Time Frame: 2003 Confidence Level: 0.9</p>	<p>Early adopters here, but gigabit will remain largely for data center uses.</p> <p>Time Frame: 2004-2005 Confidence Level: 0.9</p>	<p>Gigabit to the desktop is standard.</p> <p>Time Frame: 2006+ Confidence Level: 0.9</p>

Technical Service	Description	Short Term Forecast	Mid Term Forecast	Long Term Forecast
3.2.26 Magnetic Ink Character Recognition	<p>A character recognition system using special ink and characters which can be magnetized and read automatically. Magnetic Ink Character Recognition (MICR) is used almost exclusively in the banking industry where it is used to print details on cheques to enable automatic processing.</p> <p>Reference:</p> <p>http://wombat.doc.ic.ac.uk/foldoc/foldoc.cgi?Magnetic+Ink+Character+Recognition</p>	<p>For check writing and processing, Magnetic Ink Character Recognition (MICR) is the de facto standard.</p> <p>Time Frame: 2003 Confidence Level: 0.9</p>	<p>Electronic processing (Check truncation) is a growing area of check processing. Check information (including the MICR section) is captured and processed electronically, which further reduces paper and labor costs and improves check clearance. The introduction of desktop MICR printers is opening the marketplace to include small business operations with a need to print checks on demand, as well as by large corporations with the need for multiple site or remote-site printing.</p> <p>Time Frame: 2004-2005 Confidence Level: 0.9</p>	<p>The Federal Reserve is moving toward a MICR standard format by 2005, which will help reduce the cost and complexity of the US paper-based payment system and move essential check information more efficiently. It will further open the MICR market to organizations that were otherwise apprehensive towards choosing technologies with no definitive standard.</p> <p>Time Frame: 2006+ Confidence Level: 0.9</p>
3.2.27 Memory	<p>Generic term to describe the storage of data within a computer or device.</p>	<p>Price per gigabyte continues to fall, albeit at slower rate.</p> <p>Time Frame: 2003 Confidence Level: 0.9</p>	<p>Prices gradually fall more, memory plentiful, memory in machine rises accordingly, and parallel memory busses so speed keeps track.</p> <p>Time Frame: 2004-2005 Confidence Level: 0.9</p>	<p>Memory prices fall, but not as fast as hard drives (long term), busses keep pace with speed, faster read/write/store.</p> <p>Time Frame: 2006+ Confidence Level: 0.9</p>

Technical Service	Description	Short Term Forecast	Mid Term Forecast	Long Term Forecast
3.2.28 Middleware EAI Brokers	<p>System software or runtime infrastructure used to provide intra- and inter-application communication</p> <p>Reference:</p> <p>Gartner: The IT Professional Services Market for Enterprise Application Integration and Web Services, Note Number: ITES-WW-FR-0111</p>	<p>Increased adoption in large enterprises.</p> <p>Major middleware development companies continue to incorporate EAI features into their product families.</p> <p>Time Frame: 2003 Confidence Level: 0.9</p>	<p>Monitoring and management capabilities continue to improve as do team development capabilities. Smaller organizations begin to pilot deployments to enable more efficient electronic communications with larger partners. Trusted third parties proliferate through the market to escrow information between partners.</p> <p>Time Frame: 2004-2005 Confidence Level: 0.8</p>	<p>Commonplace in most large enterprises. Smaller enterprises deploy permanent solutions as vendors drop cost of entry to accommodate a larger market.</p> <p>Time Frame: 2006+ Confidence Level: 0.7</p>

Technical Service	Description	Short Term Forecast	Mid Term Forecast	Long Term Forecast
3.2.29 OLAP	<p>Online Analytical Processing (OLAP) is computer processing that enables a user to easily and selectively extract and view data from different points-of-view.</p> <p>Reference: http://whatis.techtarget.com/definition/0,289893,sid9_gci214137,00.html</p>	<p>More sophisticated level of computing for drill-up and drill-down. Enhanced report output formats (i.e. convergence with Query and Reporting Tools continues).</p> <p>Vendors will continue to integrate Data Mining tools into their suites to enhance the analytics.</p> <p>Time Frame: 2003 Confidence Level: 0.9</p>	<p>No predictions for significant change.</p> <p>Vendors that included Data Mining in the short term will begin to deploy rudimentary attempts to integrate the algorithms into the analysis activities to better predict the analysis goals.</p> <p>Time Frame: 2004-2005 Confidence Level: 0.7</p>	<p>No predictions for significant change.</p> <p>Online Analytical Processing (OLAP) will continue to merge with other analysis techniques to become a much more sophisticated analysis tool. This will include ad-hoc drill-through analysis of data mining results.</p> <p>Data visualization will be included to further improve user understanding, but the integration will continue to have problems as users struggle to understand how to best utilize the pieces together.</p> <p>Time Frame: 2006+ Confidence Level: 0.7</p>

Technical Service	Description	Short Term Forecast	Mid Term Forecast	Long Term Forecast
3.2.30 Peer to Peer (P2P) Computing	<p>P2P computing supplies the application architecture needed to provide multienterprise business processes, using distributed resources where they are, rather than in a centralized fashion.</p> <p>Reference:</p> <p>Gartner: New P2P Solutions Will Redefine the B2B Supply Chain, Note Number: COM-19-1316</p>	<p>Peer-to-Peer (P2P) computing has not lived up to its inflated expectations, and in the next couple of months it will fall to the wayside as Real Time Enterprise (RTE) technologies take over as the emerging technology.</p> <p>Time Frame: 2003 Confidence Level: 0.9</p>	<p>Over the next couple of years P2P computing will become a vastly improved, mature process. P2P will have moderate usability and motivation throughout the commercial, educational and government marketplace. Peer to Peer computing will continue to become a widely accepted technology allowing multiple users to communicate faster and more efficiently</p> <p>Time Frame: 2004-2005 Confidence Level: 0.8</p>	<p>In the next 5 to 10 years P2P computing will reach it's peak of acceptance and usability. Industry leaders will adopt P2P computing, those leaders will have a major effect on the industry. P2P will be a part of almost all enterprise upgrades as it continues to improve its capabilities and security.</p> <p>Time Frame: 2006+ Confidence Level: 0.8</p>

Technical Service	Description	Short Term Forecast	Mid Term Forecast	Long Term Forecast
3.2.31 Performance Metrics	<p>A business performance framework with detailed metrics to capture the business impact.</p> <p>Gartner: How to Measure the Public Value of IT, Note Number: COM-19-8949</p>	<p>Federal Agencies continue to struggle with enterprise-wide implementation of Government Performance and Results Act (GPRA) performance metric systems.</p> <p>Other public and private sector organizations will continue to use and implement limited performance evaluation programs. The majority of system implementations will use existing Business Intelligence (BI) tools and proprietary standards.</p> <p>Time Frame: 2003 Confidence Level: 0.9</p>	<p>Limited GPRA performance metric programs are implemented in the majority of Federal Agencies.</p> <p>Limited systems are also implemented in a significant number of public and private sector organizations.</p> <p>Open XML-based standards are used in the data collection processes of a fair number of organizations. XML-based formula definitions are used in a limited number of systems.</p> <p>Time Frame: 2004-2005 Confidence Level: 0.8</p>	<p>GPRA performance metric programs are fully integrated into the standard processes and practices for the majority of federal agencies.</p> <p>Enterprise performance metric programs are implemented in a significant number of public and private sector organizations.</p> <p>Data collection processes are split evenly between XML-based and proprietary standards. XML-based formula definitions are used for a fair number of performance metric systems.</p> <p>Time Frame: 2006+ Confidence Level: 0.6</p>

Technical Service	Description	Short Term Forecast	Mid Term Forecast	Long Term Forecast
3.2.32 Portals	<p>Portals provide the infrastructure to build communities of interest and practice, shared team environments, and communication and collaboration environments between an enterprise and its customers, suppliers, distributors, trading partners and design partners.</p> <p>Reference:</p> <p>Gartner: The Portal Is Dead, Long Live the Portal, Note Number: COM-19-4418</p>	<p>Several proprietary systems and interfaces. Most companies continue to develop homegrown portals to drive down internal expenditures.</p> <p>Time Frame: 2003 Confidence Level: 0.9</p>	<p>Proprietary front ends, standardized interfaces to application servers.</p> <p>The differentiation between portals and applications blurs as more Web-based applications gain functionality usually reserved for portals.</p> <p>Time Frame: 2004-2005 Confidence Level: 0.6</p>	<p>Standardized functions and components, market leaders emerge.</p> <p>Major portal developers compete and drive out smaller companies. Two or three portal providers become commonplace and drive e-Marketplace initiatives.</p> <p>Time Frame: 2006+ Confidence Level: 0.7</p>
3.2.33 Processors	<p>Microprocessor chip that does most of the data processing; the Processor and the Memory form the central part of a computer to which the peripherals are attached.</p> <p>Reference:</p> <p>http://www.hyperdictionary.com/dictionary/central+processor</p>	<p>Moore's law continues; copper technologies push frontier. 64-bit chips are the standard for UNIX boxes primarily because of memory restrictions.</p> <p>Time Frame: 2003 Confidence Level: 0.9</p>	<p>Moore's law continues; extreme speeds, multi-processors are norm, continued progress in caching. Desktop Pentium (P4) shipping with 1Megabyte (MB) of cache. 3-5 gigahertz processors available. Blade servers begin to take hold in marketplace.</p> <p>Time Frame: 2004-2005 Confidence Level: 0.9</p>	<p>Moore's law continues unabated, push toward terahertz processing. New paralleling techniques are developed which promise faster speeds without specialized software.</p> <p>Time Frame: 2006+ Confidence Level: 0.9</p>

Technical Service	Description	Short Term Forecast	Mid Term Forecast	Long Term Forecast
3.2.34 Programming Languages	<p>Programming Languages used on Application Development efforts.</p> <p>Reference:</p> <p>Gartner: Leading Programming Languages for IT Portfolio Planning, Note Number: SPA-17-6636</p> <p>Gartner: CIO Update: Microsoft and Java Technologies Reach Parity for Application Development Use, Note Number: Note Number: IGG-09112002-04</p>	<p>Visual Basic, C++ and Java becoming language of choice for new systems. Some buzz about C#. Other languages and integrated development environments such as Pascal, Delphi, PowerBuilder, Smalltalk and Natural have already been pushed into a niche area, where they will remain.</p> <p>Time Frame: 2003 Confidence Level: 0.9</p>	<p>Java, Visual Basic and C++ are standard languages for development. New languages experimental. C# will serve as a catalyst resulting in C#.Net, J#.NET, and C++.NET. C# starts to replace C++, especially in scientific applications.</p> <p>Time Frame: 2004-2005 Confidence Level: 0.7</p>	<p>Java firmly entrenched, but new languages start to compete. Java is firmly entrenched, and growing exponentially and is the leading language for new development. It is closely followed by C#. New languages experimental.</p> <p>Time Frame: 2006+ Confidence Level: 0.7</p>

Technical Service	Description	Short Term Forecast	Mid Term Forecast	Long Term Forecast
3.2.35 Public Key Infrastructure	<p>A PKI employs public-key cryptography in an enterprise-wide security infrastructure that is virtually transparent to the end user. The networked system of certification authorities, registration authorities (RAs), certificate management systems (CMSs) and directories does the following: Stores digital certificates; Allows certificates to be moved securely within the infrastructure; Enables certificates to be revoked or updated; It is also made up of standards, protocols and services.</p> <p>Reference:</p> <p>Gartner: Public-Key Infrastructure: Technology Overview, Note Number: DPRO-90693</p>	<p>PKI technology will continue to remain a promising yet underused technology used to secure the wired and wireless world over the next year. There will be a number of well-documented advantages regarding secret key cryptography, in particular in the management aspect of the different keys for verifying identity and management encryption and decryption.</p> <p>Time Frame: 2003 Confidence Level: 0.9</p>	<p>PKI will experience vast experimentation throughout a number of commercial and government organizations over the next 2-3 years.</p> <p>PKI technology will increasingly become integrated into applications as a feature, rather than remaining an end product technology. Public key infrastructures will continue to be held back by complexity and interoperability issues among different application providers as well as the complexity of administration. . These problems should be primarily resolved by XML based standards in 2004.</p> <p>Time Frame: 2004-2005 Confidence Level: 0.9</p>	<p>The benefits of PKI technology will be widely demonstrated and accepted as the tools and methodologies continue to become increasingly stable minimizing the number of technology risks. PKI will continue to reshape the industry as it reaches its plateau becoming a broadly applicable technology with numerous benefits throughout the entire marketplace.</p> <p>Time Frame: 2006+ Confidence Level: 0.8</p>

Technical Service	Description	Short Term Forecast	Mid Term Forecast	Long Term Forecast
3.2.36 Query and Reporting	<p>Tools software that is used to access business data and provide reports, analyses, visualizations and alerts to users.</p> <p>Reference:</p> <p>Gartner: Business Intelligence Tools: Perspective, Note Number: DPRO-93784</p>	<p>Convergence with OLAP tools continues. Reporting interfaces will continue to improve in usability, making report generation much easier.</p> <p>Time Frame: 2003 Confidence Level: 0.7</p>	<p>Convergence with OLAP and other decision support tools continues. XML-based querying supplemented with XML-based querying languages (e.g., XQuery).</p> <p>Time Frame: 2004-2005 Confidence Level: 0.8</p>	<p>Convergence nearly complete within 3-5 years.</p> <p>Differentiation between decision support techniques blurs as major vendors consolidate functionality into unified suites. World Wide Web Consortium's (W3C) XQuery used almost ubiquitously.</p> <p>Time Frame: 2006+ Confidence Level: 0.7</p>

Technical Service	Description	Short Term Forecast	Mid Term Forecast	Long Term Forecast
3.2.37 Radio Frequency Identification	<p>RFID (radio frequency identification) is a technology that incorporates the use of electromagnetic or electrostatic coupling in the radio frequency (RF) portion of the electromagnetic spectrum to uniquely identify an object, animal, or person.</p> <p>Reference: http://searchnetworking.techtarget.com/gDefinition/0,294236,sid7_gci805987,00.html</p>	<p>Asset tracking technology will make huge strides in managing the entire pipeline of an enterprise's value chain. The ability to automate a variety of object tracking, assembly, and inventory processes will allow organizations participating in a product value chain to escape 'bullwhip effect'. The digitization of information and the globalization of business offer new applications for id technology beyond simple supply chain optimization.</p> <p>Time Frame: 2003 Confidence Level: 0.9</p>	<p>Parasitic paper Radio Frequency Identification's (RFID) with more Random Access Memory (RAM) will be the intermediate solution. These RFIDs are inexpensive, printable, and integrated with shipping labeling.</p> <p>Time Frame: 2004-2005 Confidence Level: 0.6</p>	<p>Distance reading will increase serving more RFIDs per reader. Many RFIDs have write capabilities. Costs will drop making writable RFIDs commonplace.</p> <p>Time Frame: 2006+ Confidence Level: 0.6</p>

Technical Service	Description	Short Term Forecast	Mid Term Forecast	Long Term Forecast
3.2.38 Real Time Enterprise	<p>A Real Time Enterprise is one in which IT can make information available and connect people as soon as and when needed. In addition, where completion of a process is delayed by physical constraints — the time taken for a metal ingot to cool or for a truck to drive from one city to another — electronic sensors can monitor the situation as closely as necessary.</p> <p>Reference:</p> <p>Gartner: Creating a Real-Time Enterprise Needs Change Management, Note Number: SPA-14-7207</p>	<p>Right now the RTE will use a variety of technologies and applications to speed up key business processes. RTE will also allow organizations to receive earlier warning of key events from their business environment, so they can act on them as needed. No two organizations will use the same combination of technologies because each will have a unique business strategy that will apply their own RTE approach in order to accelerate progress to appropriate business areas.</p> <p>Time Frame: 2003 Confidence Level: 0.9</p>	<p>RTE will continue to remain a highly visible technology because of the number of real time benefits available.</p> <p>In 2004, RTE will begin to mature as a widely successful business competency, which exploits IT, in order to speed up process and information flows, as well as quickening progress in the unique business strategy of the enterprise.</p> <p>Time Frame: 2004-2005 Confidence Level: 0.8</p>	<p>Real time enterprise will continue to provide up-to-date information to progressively remove delays to the management and execution of its critical business processes.</p> <p>Continuing as the forward-thinking business strategy, RTE will continue to provide a vast number of benefits to internal management, employees, partners and external customers.</p> <p>Finally RTE will continue to improve service, reduce costs, increase transparency and improve decision-making.</p> <p>Time Frame: 2006+ Confidence Level: 0.9</p>

Technical Service	Description	Short Term Forecast	Mid Term Forecast	Long Term Forecast
3.2.39 Redefining the Perimeter	Security that is based on the notion of moving, rather than a static and robust, perimeter.	<p>Application Security will be recognized as one of the largest holes in perimeter security.</p> <p>Application security firewalls, intrusion detection and prevention devices and software will become available to supplement traditional perimeter security devices.</p> <p>Focus will still be on traditional attacks against the application (buffer overflows, cross site scripting and other methods of elevating access levels).</p> <p>Time Frame: 2003 Confidence Level: 0.9</p>	<p>Methods of managing and applying a single enterprise security policy on all perimeter devices, including application level devices, will be introduced.</p> <p>Operating systems become more secure and integrate functionality from firewalls and Intrusion Detection Systems (IDS). Application scanners will be able to suggest remediation steps for security holes that are found.</p> <p>The traditional perimeter begins to disappear, replaced by a more secure infrastructure.</p> <p>Time Frame: 2004-2005 Confidence Level: 0.7</p>	<p>Traditional perimeters all but disappear as functionality continues to be integrated in to operating systems and applications.</p> <p>Application scanners can automatically remediate problems that lead to security vulnerabilities, at the code level.</p> <p>Time Frame: 2006+ Confidence Level: 0.6</p>

Technical Service	Description	Short Term Forecast	Mid Term Forecast	Long Term Forecast
3.2.40 Single Sign-On	An enterprise that transformed all its processes in this way could rightly be called a real-time enterprise (RTE). Its internal processes would operate without latency, and managers would know the state of every process, and thus of the whole enterprise.	<p>Single Sign On (SSO) continues to be viewed as a user convenience issue and remains a solution for only a limited market.</p> <p>Time Frame: 2003 Confidence Level: 0.8</p>	<p>SSO use broadens, though slowly and modestly.</p> <p>Strong authentication through smart cards becomes more common, easing SSO password vulnerability concerns.</p> <p>Consumers' use of "e-wallet" services in their private transactions increases expectations for SSO in the workplace.</p> <p>Time Frame: 2004-2005 Confidence Level: 0.7</p>	<p>SSO becomes a functional option in most integrated enterprise software suites. These software packages offer integration with strong authentication mechanisms such as a smart card and biometrics. Users in these environments expect to log in only once.</p> <p>SSO implementation in hybrid architectures continues to be confined to environments where a small number of applications are hosted on the same operating system platform, or where users must remember many passwords.</p> <p>Time Frame: 2006+ Confidence Level: 0.6</p>

Technical Service	Description	Short Term Forecast	Mid Term Forecast	Long Term Forecast
3.2.41 Smart Cards	<p>A chip card that is the size of a credit card or Subscriber Identity Module (SIM) card and contains a microcontroller IC. Smart cards contain a microcontroller, typically with mask ROM and electronically erasable programmable read-only memory (EEPROM) for personalization.</p> <p>Reference:</p> <p>Gartner: Smart Cards, Smart IDs and the Semiconductor Industry, Note Number: SEMC-WW-DP-0316</p>	<p>Java cards dominate the market over Non-Java cards at a ratio of 4 to 1 despite higher costs. \$8 per Java card vs. <\$1 for crypto cards.</p> <p>Time Frame: 2003 Confidence Level: 0.8</p>	<p>Marked increase in use by non-North American vendors and merchants. Smart card mobile networks emerge. Crypto cards continue to be replaced by Java cards.</p> <p>Time Frame: 2004-2005 Confidence Level: 0.8</p>	<p>Evolution toward multiple pieces of smart card hardware: a crypto chip and a processing chip comprise the hardware layer. On top of the hardware layer is the smart card OS. Plastic displays are inexpensive but won't start appearing until 2 years out.</p> <p>Time Frame: 2006+ Confidence Level: 0.8</p>

Technical Service	Description	Short Term Forecast	Mid Term Forecast	Long Term Forecast
3.2.42 Social Network Analysis	<p>Social network analysis [SNA] is the mapping and measuring of relationships and flows between people, groups, organizations, computers or other information/knowledge processing entities. The nodes in the network are the people and groups while the links show relationships or flows between the nodes. SNA provides both a visual and a mathematical analysis of human relationships.</p> <p>Reference:</p> <p>http://www.orgnet.com/sna.html</p>	<p>Several management-consulting firms are using this technique to improve knowledge management and provide insights to their client's organizations. Use in the scientific community is growing, particularly in medicine, physics and social sciences.</p> <p>Time Frame: 2003 Confidence Level: 0.9</p>	<p>Continued demonstrated benefits will increase the demand for this tool.</p> <p>Time Frame: 2004-2005 Confidence Level: 0.8</p>	<p>Organizations realize that their complexity cannot be adequately assessed by qualitative means. Social Network Analysis (SNA) will be among a suite of tools used for dynamic business modeling.</p> <p>Time Frame: 2006+ Confidence Level: 0.7</p>

Technical Service	Description	Short Term Forecast	Mid Term Forecast	Long Term Forecast
3.2.43 Software Development Tools	<p>Typically, these are development environments built around a compiler and a language such as C/C++ and Java language IDEs. Language-oriented IDEs generally include graphical user interface (GUI) builders, debuggers, editors and other utilities that are integrated into the environment.</p> <p>Reference:</p> <p>Gartner: Infrastructure and Applications Worldwide Software Market Definitions, Note Number: SOFT-WW-GU-0004</p>	<p>Software development tools still reflect idea that software is developed from scratch. Integration tools still assume that software was developed in house.</p> <p>Time Frame: 2003 Confidence Level: 0.6</p>	<p>Software development tools more component-oriented to allow integration of standardized components. Integration tools assume a standard format for components, such as Enterprise Java Beans.</p> <p>Time Frame: 2004-2005 Confidence Level: 0.8</p>	<p>Engineering tools now assume that components are selected off-the-shelf from independent vendors. The tools operate on tool framework making inter-operation and information sharing possible. Standardized interfaces, such as Enterprise Java Beans, are the norm and are expected.</p> <p>Time Frame: 2006+ Confidence Level: 0.7</p>

Technical Service	Description	Short Term Forecast	Mid Term Forecast	Long Term Forecast
3.2.44 Software Engineering	Software Engineering refers to the best-practice processes used to create and maintain software, rather than the haphazard methods that have plagued the software industry.	<p>Architecture and engineering of software systems remains an art form. Reference architectures and design patterns make appearance in academia and some application in practice. Less engineering and more integration of existing packages is the trend.</p> <p>Time Frame: 2003 Confidence Level: 0.9</p>	<p>Remains an art form. More use of standardized architectures in practice. Standards more under control of standards bodies and competing standards are weaned out gradually. Government intervention in standards bodies such as the National Institute of Standards and Technology (NIST).</p> <p>Time Frame: 2004-2005 Confidence Level: 0.6</p>	<p>Software development less an art form. Full government intervention via standards bodies (e.g., NIST) to assume ownership of standards. Mandatory use of standards for interfaces.</p> <p>Time Frame: 2006+ Confidence Level: 0.6</p>

Technical Service	Description	Short Term Forecast	Mid Term Forecast	Long Term Forecast
3.2.45 Software Modeling Tools	Software Modeling tools help developers deal with the complexity of developing many new applications. They allow developers to build models and then test and simulate various scenarios.	<p>Software engineers are using tools, although they can be difficult to use due to the difficulty in collecting data to build and calibrate models. Tools cover all tiers and layers of the applications (not just the network) although they need to mature. Tools are only as effective as practitioners using them due to maturity of methods and practitioners. In the absence of effective tools, architects and engineers will resort to simple drawing tools.</p> <p>Time Frame: 2003 Confidence Level: 0.9</p>	<p>Modeling tools integrate with systems management tools to collect data. Tools begin to embrace open source standards. Tools operate and interoperate within tool frameworks.</p> <p>Tools continue to mature and as they do enterprises must ensure that architectures are maintained and updated using new and improved function of the tools.</p> <p>Time Frame: 2004-2005 Confidence Level: 0.8</p>	<p>Tools support the entire life cycle of product development from concept to daily operations.</p> <p>Tools still evolving with methods.</p> <p>Time Frame: 2006+ Confidence Level: 0.7</p>

Technical Service	Description	Short Term Forecast	Mid Term Forecast	Long Term Forecast
3.2.46 Storage Area Network	<p>A network of storage disks. In large enterprises, a SAN connects multiple servers to a centralized pool of disk storage.</p> <p>Reference:</p> <p>http://www.techweb.com/encyclopedia/defineterm?term=san</p>	<p>Vendors build tape storage systems that are all fiber channel Storage Area Network (SAN) attached, offloading traffic over the standard data networks.</p> <p>SANs are in use today. Companies like IBM have made SANs an integral part of their Global Web Architecture. SANs used to make Internet Protocol (IP) based storage available to users for information exchange via Instant Messaging and e-mail applications.</p> <p>Time Frame: 2003 Confidence Level: 0.9</p>	<p>Large data centers adopt fiber channel and gigabit Ethernet interfaces on the same box. Interoperability issues continue to plague industry. Require storage architects to configure and support.</p> <p>Time Frame: 2004-2005 Confidence Level: 0.9</p>	<p>Interoperability issues begin to get addressed. Services become much more plug and play. SANs make storage services and the storage aspects of Grid computing a reality.</p> <p>Time Frame: 2006+ Confidence Level: 0.9</p>
3.2.47 Utility Computing	<p>Utility computing refers to managed technology resources and services that are made available as needed and billed as used.</p> <p>Reference:</p> <p>Giga: Defining Utility Computing and Utility Services, Adria Ferguson</p>	<p>Technically advanced corporations begin to implement within organizational borders.</p> <p>Time Frame: 2003 Confidence Level: 0.9</p>	<p>Server resources (application, database, web, etc.) begin to consolidate and efficiency is gained. Large enterprises begin to implement.</p> <p>Time Frame: 2004-2005 Confidence Level: 0.8</p>	<p>A new breed of hosting facilities (service providers) materializes providing entire computing infrastructures for organizations.</p> <p>Time Frame: 2006+ Confidence Level: 0.7</p>

Technical Service	Description	Short Term Forecast	Mid Term Forecast	Long Term Forecast
3.2.48 Virtual Private Network	<p>A private network that is configured within a public network in order to take advantage of the economies of scale and management facilities of large networks.</p> <p>Reference:</p> <p>http://www.techweb.com/encyclopedia/defineterm?term=vpn</p>	<p>Virtual Private Network (VPN) technology continues to experience an onslaught of standards and problematic issues. Whole industries, such as the automotive industry, have moved to VPN technology as the basis of their extranets for eBusiness and other extensively used activities.</p> <p>Time Frame: 2003 Confidence Level: 0.9</p>	<p>VPN technology will reach its plateau of productivity in less than two years. This is because VPN has continued to be a widely accepted technology with real world benefit that will be widely demonstrated and accepted among the majority of organizations worldwide. Tools and methodologies will become increasingly stable and virtual private networks will be broadly applicable as the benefits are felt across all markets.</p> <p>Time Frame: 2004-2005 Confidence Level: 0.9</p>	<p>The technology will continue to dominate the market as entire organizations move to VPN as the backbone of their e-Business and RTE. Technology planners will focus on the value of the technology that VPN provides to their enterprise as VPN continues to have a high impact on all technologies. VPN will have minimal risks and numerous benefits as it continues to become a business standard.</p> <p>Time Frame: 2006+ Confidence Level: 0.9</p>

Technical Service	Description	Short Term Forecast	Mid Term Forecast	Long Term Forecast
3.2.49 Virus Protection	Software and techniques that protect against malicious software designed to infect computers.	<p>Virus protection will continue to be signature-based, thereby forcing organizations into a reactionary role as new attack vectors appear. Vendors will continue to develop more effective virus management solutions, but organizations will find deployment of such solutions difficult to maintain. As network security functionalities converge into universal devices, vendors will begin to include network-based virus protection as well.</p> <p>Time Frame: 2003 Confidence Level: 0.9</p>	<p>New developments in understanding heuristics will improve virus protection technology by providing it with a more proactive component. Centralized virus management will improve greatly, and network-based virus protection will gain prominence.</p> <p>Filtering is not likely to become a router function due to covert channels / packet attacks. While AV and Intrusion Detection are being integrated and become more pervasive they are still predominantly distinct end point solutions.</p> <p>Time Frame: 2004-2005 Confidence Level: 0.6</p>	<p>Filtering becomes built into backbone routers as part of the Input/Output Subsystem (IOS) as a matter of course. Virus and other security features come under government control as part of NIST's charter. Router performance would suffer greatly from the need to analyze traffic for viruses. Anti-virus software will begin to merge with intrusion detection software to form a unified solution in the four to six year terms. Advances in both areas will enable improved learning of attack events and the ability to communicate potential attacks to other systems and devices.</p> <p>Time Frame: 2006+ Confidence Level: 0.7</p>

Technical Service	Description	Short Term Forecast	Mid Term Forecast	Long Term Forecast
3.2.50 Voice Over Internet Protocol	<p>The two-way transmission of audio over a packet-switched IP network. When used in a private intranet or Wide Area Network (WAN), it is generally known as "VoIP." When the transport is the public Internet or the Internet backbone from a major carrier, it is generally called "IP telephony" or "Internet telephony."</p> <p>Reference:</p> <p>http://www.techweb.com/encyclopedia/defineterm?term=IPtelephony</p>	<p>Currently Voice Over Internet Protocol (VOIP) has little visibility although it is a fairly mature technology. Despite its long-promised cost savings, it is still at an early stage of commercialization and is primarily still in the trial phase. This is largely due to the variety of prevailing risks, such as latencies, lack of quality of service, scalability issues and standards compliance that will continue to haunt VOIP over the next few months.</p> <p>Time Frame: 2003 Confidence Level: 0.7</p>	<p>VOIP will experience focused experimentation and solid hard work by an increasingly diverse range of organizations and industry leaders, which will lead to a true understanding of the technology applicability, risks and benefits. VOIP will begin to reach its plateau over the next two to five years.</p> <p>Time Frame: 2004-2005 Confidence Level: 0.9</p>	<p>VOIP technology will finally become a mainstream technology. Numerous COTS methodologies and tools will become available allowing VOIP to have an ease of development and integration among commercial and government enterprise infrastructures.</p> <p>Time Frame: 2006+ Confidence Level: 0.8</p>

Technical Service	Description	Short Term Forecast	Mid Term Forecast	Long Term Forecast
3.2.51 Web Servers	<p>Standards supporting the implementation and operations of web services based applications and capabilities</p> <p>Reference:</p> <p>Hype Cycle for Web Services, 2003</p> <p>30 May 2003</p> <p>Whit Andrews David Mitchell (NH) Smith Benoit Lheureux Cameron Haight Daryl C. Plummer Larry Perlstein Michele Cantara</p> <p>Reference:</p> <p>http://www.techweb.com/encyclopedia/defineterm?term=WEBSERVER&exact=1</p>	<p>Trend to web servers as front end for app servers. Apache IBM Hyper Text Transfer Protocol (HTTP) Server (HS) and Windows continue to be the dominant web servers.</p> <p>Time Frame: 2003 Confidence Level: 0.9</p>	<p>Web servers will begin to evolve over the next two years to serve application server content while protecting the application from intrusion. Windows Operating System costs are impetus for industry leaders and Fortune 500 companies to take a serious look at IBM Hyper Text Transfer Protocol Server (HS) on Linux.</p> <p>Time Frame: 2004-2005 Confidence Level: 0.6</p>	<p>Continued trend to standardization of interfaces to web app servers and other components of system. Also become front end to rich media or broadband applications and content distribution.</p> <p>Web servers will move towards a sort of application security function where organizations will be able to use the server as a tap to protect the web application (firewall), monitor it (intrusion detection), and serve as the point of authentication for multiple apps. Web server stands a good chance to be the hub for securing web applications.</p> <p>Time Frame: 2006+ Confidence Level: 0.7</p>

Appendix A – Engineering Decisions Record

Throughout the development of the BEA TV products, analysts and engineers make a number of decisions that affect the content of each new product release. These decisions occur periodically during the TV development process, a process comprised of five high order procedures. These are:

- Identify and define technical services and standards data,
- Organize standards
- Collect additional information through subject matter expert interviews,
- Refine the data collection to target BEA requirements, and
- Produce the TV-1, TV-2, and SV-9 products.

The Engineering Decisions made during these procedures, and their impact upon the BEA Technical View products, is as follows:

A.1 Identify and Define Technical Services and Standards Data

The widest possible array of authoritative sources are consulted for guidance, illumination, and cross reference of standards, either mandated or emerging, within the DoD and its services. On-going business and technical analysis of mandated standards in the DISR determines relevance to the BEA TV-1. Standards that do not directly apply to business systems (such as standards for routing protocols, backplane buses, and weapons systems) in the business domains are outside the scope of the BEA TV-1.

In order to avoid influencing system developers and architecture users toward a particular commercial solution, a conscious effort is made by BEA during the development of the TV-2 and SV-9 products to provide a balanced technical focus on appropriate technologies and the standards that support them. No particular vendor's standards or technologies dominate the TV-2 and SV-9 products. These architecture products do not focus on the commercial products that may implement any of the BEA standards or technologies.

Some specific recent TV-1, TV-2 and SV-9 development activities include the following:

- The Application, Collaboration, Discovery, ESM, IAS, Infrastructure Transport, Mediation, Messaging, Storage, and User Assistance Core Enterprise Services were added to the SV-9 as BEA Technical Services.
- Standards with updated references for DISR standards and references to additional information were mapped to Technical Services, including to the newly added Technical Services that represent the Core Enterprise Services when appropriate.
- Newly added Technical Services have forecasts based on information from many industry analysis sources, including the latest GES Technology Trends and Forecast Reports by Gartner Research.

- The forecasts for Technical Services that currently have standards linked to them in the BEA were updated. Older forecasts for Technical Services that do not currently have standards linked to them in the BEA have not been updated. Technical Services that did not have standards linked to them and that did not have forecasts associated with them have been removed from the BEA. Forecasts and the confidence level of the forecasts for some emerging technologies such as Grid Computing were reviewed. References to some of the analysis sources have been provided for forecasts in such cases where possible.
- 46 TV standards were updated
- 71 new standards were added
- 22 standards were deleted

DISR references as well as references to additional sources of information, as appropriate, were updated for all standards.

A.2 Organize Technical Services data into a data repository

- 1 Use Popkin System Architect v10.0 (and updates) as the Data Repository and schema for standards related data.

Impact: A program level decision, designed to facilitate the integration of data between Operational View (OV), SV and TV products.

- 2 Use Microsoft Excel as the working repository of Technical Services related data.

Impact: The use of Excel decreases the requirement for additional operator training on the Popkin product. Excel increases the flexibility with which multiple analysts could interact with data repository. Excel increases the ease with which draft versions of the repository are shared with other members of the BEA development team. Excel alleviates the limitations placed upon users who need access to work with the data repository (licenses, learning curve, and level of effort). Excel increases the team's ability to perform analytical reviews of the data repository using Excel's data analysis capabilities.

- 3 Load the Popkin Data Repository immediately prior to product delivery

Impact: Latest available version of data available through Popkin Systems Architect is the version last delivered as a finished product.

A.3 Collect additional information through subject matter expert interviews

The Scope of BEA does not extend to the wide area network.

Impact: Team analysts concluded that BEA based systems are implemented largely on existing communications infrastructure, or in places where standards for such infrastructures already exist. It is outside of the realm of responsibility for BEA to mandate the telecommunications standards deployed at a given facility. This decision allows the TV analysts to scope the area to which BEA standards apply. That scope encloses all hardware and software components within a given BEA compliant system, extending to the network

layer for the purpose of Local Area Network communications. The limits of the BEA scope are: (1) the communications medium used to interface with a BEA compliant system (for example, RJ-45 cable, universal serial bus, or wireless interfaces, and so forth.) and (2) the communications protocol employed by that link (for example, Transmission Control Protocol/Internet Protocol (TCP/IP)). Telecommunications devices such as routers and switches are considered part of the site infrastructure and therefore beyond the limits of the BEA mandate.

Conduct periodic interviews with industry and DoD technology authorities.

Impact: This decision is derived from the project plan; however, specific implementation is subject to the team consensus regarding areas of technology that should be addressed first. Therefore, areas such as security or web services may hold an apparently arbitrary advantage over technologies such as XML based upon the Engineering Decision of the TV analyst.

Participate in DISR Information Technology Standards Working Groups (ISWGs).

Impact: This provides a forum for discussing the standards with representatives from various DoD organizations who have the proper technical, functional, and acquisition expertise from their organizations. The ISWGs are responsible for making recommendations for updating the DISR. The technology areas provide the primary body for identifying the lifecycle stage of each standard and profile contained in the DISR. The ISWGs are responsible for making recommendations for updating the DISR.

A.4 Data analysis to target BEA requirements

1. Tailor the collection of Technical Services and associated Forecasts to meet BEA requirements.

Impact: The repository of Technical Services changes as needed by Engineering Decision to eliminate Technical Services that are outside the area of direct interest to BEA and include new Technical services when appropriate.

To better align with the newly emerging DISR Standards organization schema, the Application, Collaboration, Discovery, ESM, IAS, Infrastructure Transport, Mediation, Messaging, Storage, and User Assistance, Logistics and Human Resources enterprise services are treated as BEA Technical Services. Where appropriate, Technical Services have BEA forecasts based on information from many industry analysis sources, including the latest GES Technology Trends and Forecast Reports by Gartner Research. Standards with updated references for DISR standards and references to additional sources of information were linked to BEA Technical Services, including to the newly added Technical Services that represent the Core Enterprise Services, as appropriate.

Below is a list of some standards that were previously in the list of BEA standards but have recently been retired because they were either superseded by newer standards, made irrelevant by the latest version of DISR, or deemed irrelevant based on analysis:

- ANSI T1.112:2001
- ANSI/AIAA R-004

- DoD AIMS 03-1000
- IETF RFC 2251
- IETF RFC 2314
- IETF RFC 2437
- IETF RFC 2459
- IETF RFC 2479
- IETF RFC 2559
- IETF RFC 2587
- IETF RFC 2633
- IETF RFC 3152
- ISO 9660
- ISO/IEC 15287-2
- MIL-STD-188-166
- MIL-STD-188-170
- MIL-STD-188-182B
- MIL-STD-2525B
- MIL-STD-3011
- OMG documentformal/01-03-08
- SDN.706
- SDN.903

Below is a list of some of the standards that were previously not in the list of BEA standards but have recently been added because they are either newly introduced in the latest version of the DISR (JTA 6.0), or otherwise considered relevant to the BEA based on technical analysis of the standards. Note that this list includes both BEA Mandated (TV-1) and BEA Emerging (TV-2) standards:

- ANSI/AIM-BC1
- ANSI/NIST-ITL 1 (National Institute of Standards and Technology)
- ANSI/US PRO-100
- ISO 10303-1

- ISO 10303-101:1999
- ISO 10303-105:1996
- ISO 10303-11
- ISO 10303-201
- ISO 10303-202
- ISO 10303-203:1994
- ISO 10303-204
- ISO 10303-21:2002
- ISO 10303-22:1998
- ISO 10303-224:2001
- ISO 10303-31
- ISO 10303-32
- ISO 10303-41:2000
- ISO 10303-42:2000
- ISO 10303-43:2000
- ISO 10303-44:2000
- ISO 10303-45
- ISO 10303-46
- ISO 10303-47
- ISO 10303-49
- ISO/CD 10303-218
- ISO/IEC 13584-20
- ISO/IEC 13584-42
- ISO/IEC 15693-1:2000
- ISO/IEC 15693-2:2001
- ISO/IEC 15693-3:2001
- ISO/IEC 7816-1

- ISO/IEC 7816-10:1999
- ISO/IEC 7816-2
- ISO/IEC 7816-3
- ISO/IEC 7816-4/AM1:1997
- ISO/IEC 7816-5/AM1:1996
- ISO/IEC 7816-6/Amd 1:2000
- ISO/IEC 7816-7
- ISO/IEC 7816-8:1999
- ISO/IEC 7816-9:2000
- ISO/IEC CD 7816-11
- ISO/IEC CD 7816-15
- ISO/TR 10303-12
- MIL-PRF-28001C
- DoD Non-commercial DID
- EPC Tag Spec v1.1
- Passive RFID Air Interface Class 1
- RF-Tag v2.0
- CIMCPP
- IETF RFC 3414
- MLOSPP
- PKIKMITKNPP
- PP_FWPP-MR
- RSA Labs PKCS #12:1999
- SAML 1.1 OASIS
- SLOSPP
- WS-Security 1.0 OASIS
- XML-Encryption W3C

- ANSI/IEEE 754
- FIPS Pub 184
- IETF Standard 33/RFC 1350
- ISO/IEC 9075
- ISO/IEC 9075-3
- ISO/IEC 9945-1:Real-time
- ISO/IEC 9945-1:Thread
- OMG ptc/03-07-07
- WS-I Basic Profile 1.0
- XHTML 1.1: 31 May 2001
- XMI-ax
- XML 1.1:2004
- IETF RFC 2030

Below is a list of some standards that were previously in the list of BEA standards but have recently been reviewed and updated rather because a newer version was available, or the update was necessary for alignment with the DISR:

- ASC X12N 270/271:2002
- ASC X12N 276/277:2002
- ASC X12N 278:2002
- ASC X12N 820:2002
- ASC X12N 834:2002
- ASC X12N 835:2002
- ASC X12N 837 Dent:2002
- ASC X12N 837 Inst:2002
- ASC X12N 837 Prof:2002
- C321
- C808
- CAPP

- CSS1:1999
- DICOM:2003
- DOM 1.0
- FIPS Pub 180-2
- FIPS Pub 197
- Intrusion Detection System (IDS) Analyzer:2002
- IDS Scanner:2002
- IETF RFC 3377
- IETF RFC 3596
- IETF RFC 1981
- IETF RFC 1990
- IETF RFC 2126
- IETF RFC 2464
- IETF RFC 2474
- IETF RFC 3315
- ISBT 128 v1.4
- ISO/IEC 8802-11:2003
- ISO/IEC 8802-3:2000 (IEEE Std. 802.3-2002)
- ISO/IEC 9075-5
- ITU-T X.500:2001
- Linux 2.0
- Linux 2.0 IA32
- Linux 2.0 PPC32
- LSPP
- MISP v2.4
- NCPDP Batch v1.1
- ODMG 3.0

- OMG document formal/99-10-07:2004
- SOAP 1.1
- Traffic Filtering Firewall - Low Risk
- Traffic Filtering Firewall - Medium Robustness 1.4
- Win32 Application Programming Interfaces (APIs)-Current
- XHTML 1.0:2002
- XSLT 2.0:2003

A.5 Produce the TV-1, TV-2 and SV-9 products

1. Use custom reports from the Popkin System Architect and the predefined TV-1, TV-2, and SV-9 reports as the basis for the data and layout for the architecture products.

Impact: The predefined TV-1, TV-2, and SV-9 reports are inadequate for the needs of the BEA development team. They are used as a baseline, but extensive post editing, reformatting, and inclusion of additional information changes the documents to achieve a more desirable product.